

**CLASS 96, GAS SEPARATION: APPARATUS****SECTION I - CLASS DEFINITION**

This class provides for apparatus used in separation of a gas from a fluid mixture comprising (i) a gas and solid or liquid particles entrained therein, (ii) a liquid and gas entrained therein, or (iii) a plurality of gases. As a general rule for this class, there must be a relationship of apparatus parts embracing: (a) an inlet for the fluid mixture to be treated, (b) a means effective to cause separation into constituent parts, and (c) an outlet for at least one constituent separate and distinct from an outlet for another constituent, which may be for removal of the separating media itself, or a single outlet used at different times to remove the separated constituents. The gas separation apparatus for this class does not include means in which the separation is caused by a chemical reaction.

The basic subject matter of this class is of a subcombination nature and may include only such ancillary apparatus (e.g., fluid handling means, etc.) as is necessary to perfect the gas separating function. Significant inclusion in a claim of features beyond merely perfecting the gas separating function indicates classification in a more comprehensive class. Generally, however, the mere naming of an art device in a claim to a gas separator does not affect classification. Thus, a claim to an air filter combined with a nominally included motor vehicle is proper for this class.

**SECTION II - NOTES TO THE CLASS DEFINITION**

- (1) Note. The gas separation apparatus for this class generally involves means to use a magnetic field, to use an electrical field, to diffuse selectively, to sorb on a solid sorbent, to degasify a liquid, to contact a gas with a liquid, to filter, or to deflect, or involves other mechanical means. See Lines With Other Classes, below, for the line concerning the means in which the gas separation is caused by a chemical reaction.
- (2) Note. This class also provides for the subcombination of the separating media, per se, when disclosed for gas separating. However, see Lines with other Classes, and References to Other Classes, below, for solid sorbents and liquid sorbents.

- (3) Note. Devices which may inherently perform a gas separating function but are not found in this class include grids, gratings, grilles, woven fabrics, screens, and the like. They will be found in a stock material class, for which see Lines With Other Classes, Below. However, devices of these types when positively stated as being for gas separation will be found in Class 96.
- (4) Note. This class also provides for apparatus in which the fluid mixture is treated to change its make-up, but no real separation occurs, provided no other suitable classification exists. Accordingly, in this class are found "spark arresters," which merely change the size of particles entrained in a gas. (See References To Other Classes for the line concerning spark arresters when used on furnaces.) These devices are usually deflectors or screens and are included in this class because of their similarity to apparatus which actually separate the fluid mixture into constituent parts. Similarly, agglomerators which by themselves may not separate constituents of a fluid mixture, but cause small particles therein to join together or coalesce to form larger particles, are in this class unless basis for other classification exists.

**SECTION III - LINES WITH OTHER CLASSES AND WITHIN THIS CLASS**

See the class search note for Class 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, for the line concerning the means in which the gas separation is caused by a chemical reaction.

Solid sorbants are found in Class 502, Catalyst, Solid Sorbent, or Support Therefor: Product or Process of Making, and liquid sorbents are found in Class 252, Compositions. (Also see the search class notes below.)

Devices which may inherently perform a gas separating function but are not found in this class include grids, gratings, grilles, woven fabrics, screens, and the like. They will be found in a stock material class (e.g., Class 428, Stock Material or Miscellaneous Articles, etc.).



## SECTION IV - REFERENCES TO OTHER CLASSES

### SEE OR SEARCH CLASS:

- 15, Brushing, Scrubbing, and General Cleaning, appropriate subclasses for gas separation devices claimed in combination with a work contacting tool (e.g., a vacuum cleaner comprising a device contacting the work to be cleaned and an air filter, etc.) and subclasses 301+ for gas separating means associated with fixed position or installed cleaners. For classification in Class 15, subclasses 301+, it is not necessary to claim the work contacting tool; it is sufficient to claim a building modification to accommodate the system parts or some special modification of the apparatus for its intended use, such modification going beyond mere ground support means.
- 34, Drying and Gas or Vapor Contact With Solids, appropriate subclasses for generic apparatus for separating liquids from solids (i.e., drying) and the contacting of solids with either gases or vapors. Class 96 takes the apparatus for the separation of a gas from a fluid mixture in combination with means to regenerate the separating media by drying or by gas or vapor contact.
- 47, Plant Husbandry, appropriate subclasses for apparatus for separation of a gas from a fluid mixture by use of a plant of higher order.
- 48, Gas: Heating and Illuminating, appropriate subclasses for apparatus for the manufacture of heating and illuminating gases and means for the purification, distribution, and storage thereof.
- 60, Power Plants, subclasses 272+ for a power plant of the internal combustion engine type with treatment or handling of exhaust gas.
- 62, Refrigeration, appropriate subclasses for apparatus peculiar to removing heat from a substance, usually by a change of phase of a coolant or refrigerant, and for apparatus involving subject matter for Class 96 combined with significant refrigeration apparatus. Examples of significant refrigeration are: (i) expansion of a gas through an orifice whereby cooling is effected to condense any of the constituents of the gas by such temperature reduction; (ii) a significant physical relationship or arrangement between elements of a refrigeration circuit (e.g., two related refrigeration coils, detailed description of the circuit, etc.); (iii) change of phase of a coolant or refrigerant (i.e., evaporation, melting, or sublimation) whereby cooling is effected to condense any of the constituents of the gas by such temperature reduction. Some examples of what may be found in Class 62 are: (a) separation of a constituent from a plurality of gases by a significantly claimed refrigeration step or apparatus; (b) condensation of moisture from the atmosphere as a result of a refrigeration operation; (c) gas drying by sorption followed by contacting the dried gas with a liquid to produce cooling by evaporation; (d) a refrigerated enclosure combined with sorption means; (e) refrigeration producing processes and apparatus combined with steps or means for drying the refrigerant; and (f) extracting a constituent from a plurality of gases by liquefaction and separation (e.g., fractionation or distillation, etc.).
- 73, Measuring and Testing, subclasses 23.2+ for apparatus for gas analysis, per se, and also the combination of gas separation apparatus and significant gas analysis means. The combination of gas separation apparatus and nominal means for "analyzing" or "detecting" without further detail of the analysis or detection means is insufficient to cause a patent to be placed in Class 73; that patent will be placed in Class 96. Also, if there is feedback means from the analytical apparatus to control or effect a change in the gas separation, then classification is in Class 96. For volume or rate of flow meters combined with gas-liquid separators, see Class 73, subclass 200.
- 95, Gas Separation: Processes, for the corresponding processes to the apparatus of Class 96. When a patent has a claim or claims to a Class 95 process and a claim or claims to a Class 96 apparatus, the patent will be placed as an original in Class 95, even though there may be an apparatus claim that is more comprehensive than a process claim.
- 110, Furnaces, subclasses 119+ for significant furnace apparatus including a spark arrester.
- 118, Coating Apparatus, subclasses 715+ for coating apparatus in which the coating material used is either gaseous or vaporous. The apparatus may have gas separation means for removing foreign or undesirable components from the coating material.
- 122, Liquid Heaters and Vaporizers, subclass 492 for devices located in the steam dome of a boiler for separating water from steam.
- 123, Internal-Combustion Engines, subclasses 518+ for internal-combustion engines including a



- charge-forming device having a fuel vapor recovery and storage system.
- 128, Surgery, subclasses 200.24+ for apparatus for supplying a breathable gas to, or exhausting such gas from, a living body. Subclass 200.24 and the subclasses mentioned below require that the apparatus be adapted for use on or in the living body and also include diagnostic or therapeutic apparatus when the only disclosed utility is for diagnosis or treatment of a living body. See especially subclass 200.25 for an artificial gill or means for separating entrained air from a liquid stream; subclass 201.25 for a respiratory device including body or head supported means covering user's scalp and means for removing a substance from respiratory gas; subclass 204.16 for removal of a substance from respiratory gas by cooling; subclass 205.12 for means for supplying respiratory gas under positive pressure including means for removing a substance from the respiratory gas; and subclass 205.27 for a respiratory device including means for removing a substance from a respiratory gas.
- 131, Tobacco, subclasses 331+ for means for removing or separating a constituent material from tobacco smoke combined with tobacco products or disclosed for use with a tobacco user's appliance or article where the disclosure or claim is directed solely to such use. A copy of a patent so limited as above should be placed as a cross-reference in Class 96 if general utility for gas separation is recognized.
- 137, Fluid Handling, appropriate subclasses for combinations of fluid handling apparatus and gas separation apparatus involving more than mere flow control (e.g., valving, etc.) to or from the gas separating apparatus. (i) For classification in either Class 137 or Class 96 where both the fluid handling apparatus and gas separation apparatus are included in the combination, classification will be based upon the ultimate purpose of the subject matter and not on the ancillary or subordinate feature of the combination consistent with the objects and aims therefor (e.g., it is not intended that the inclusion of a fabric filter no matter how specifically defined will be sufficient to carry a "gas field storage and distribution system" to Class 96, whether the filter protects the operating parts of the system or is the most downstream element thereof). The fluid handling for Class 96 should be no more than that necessary to convey or conduct the fluid mixture to, at, or away from the point of separation. (ii) However, where (a) the Class 137 feature is a simple valve (e.g., a check valve, a mere stop and go valve, or a mere flow control valve as distinct from a multiway valve or a pressure regulator), (b) the gas separation apparatus and valve are in an intimate flow relationship within a gas conduit, and (c) the gas separation apparatus is claimed by more than name only, classification is in Class 96, regardless of the ultimate purpose of the subject matter and irrespective of the details of the valve recited in the claim. (iii) Class 137 also takes separation of gases from gases, liquids, or solids by gravitational means only (i.e., where no specific means is claimed for effecting the separation). A single expansion chamber alone which separates a fluid mixture is not regarded as a specific separating means. However, two such chambers (in series or parallel) are considered to be specific. If there is a baffle or other impingement surface claimed, other than the wall of the chamber itself, such apparatus is to be placed in Class 96.
- 141, Fluent Material Handling, With Receiver or Receiver Coacting Means, appropriate subclasses for apparatus for transferring fluent material through a flow confining system, the source and receiver parts of which are normally separable.
- 156, Adhesive Bonding and Miscellaneous Chemical Manufacture, appropriate subclasses for apparatus there classified for adhesively bonding and otherwise manufacturing filters.
- 160, Flexible or Portable Closure, Partition, or Panel, appropriate subclasses for flexible fabric panel units and subclasses 382+ for fabric fastening means. Class 160 is the generic class for panel units having flexible fabric and takes flexible fabric panel units having several different named purposes, one of which may be gas separation. Class 96 takes a panel unit having flexible fabric when used only for gas separation.
- 165, Heat Exchange, appropriate subclasses for apparatus where only indirect heat exchange is involved and subclasses 58+ for a heating and cooling system with an ancillary separator. However, cold wall-hot wall thermal diffusion apparatus will be found in Class 96, subclass 221.
- 166, Wells, for shafts or deep borings in the earth for the extraction of fluids from the earth. Gas separation apparatus including a nominal reci-



- tation of a well is proper for Class 96. For classification in Class 166, some details specific to wells should be recited for the combination of gas separation apparatus and a well. However, in the situation in which one of the constituents separated is inserted into an input well, a mere broad recitation of such well is sufficient for classification in Class 166.
- 180, Motor Vehicles, subclass 68.3 for modified vehicle structure such as hood modifications and other air inlets (e.g., body grille, etc.) with conduits or connections to or for carburetor intake and including filter means.
- 181, Acoustics, subclass 231 for a muffler with a solid particle separator (e.g., spark arrester, vacuum cleaner, etc.). See Class 96, subclasses 380+ for gas separation apparatus with sound damping means.
- 196, Mineral Oils: Apparatus, for apparatus for treating, refining, or recovering mineral oils such as petroleum, coal, tar, pitch, asphalt, or related products. Class 196 takes apparatus having means for gas separation combined with significant means to treat, refine, or recover mineral oils.
- 202, Distillation: Apparatus, appropriate subclasses for apparatus for the volatilization of a substance from either solids or liquids for the purpose of recovering material from the vapor produced by condensation or absorption. Other means for the physical treatment of the vapor may be included (e.g., filter, deflector, dephlegmator, etc.).
- 204, Chemistry: Electrical and Wave Energy, subclasses 193+ for apparatus in which a chemical change is brought about by the application of an electric current to material being treated wherein more than the mere thermal effect of the current is involved, and subclasses 660+ for apparatus for the separation or purification of liquids by the physical or physical-chemical action of an electrical stress.
- 209, Classifying, Separating, and Assorting Solids, subclasses indented under subclass 21 and 133 that include "deposition" in their titles for apparatus for the separating and segregating into grades components of solid mixtures employing a gaseous suspending medium which is separated from the solids.
- 210, Liquid Purification or Separation, appropriate subclasses for apparatus for the separation of a constituent from a flowable liquid mixture; except for apparatus for the separation of a gas initially present in a liquid mixture. Class 210 is superior to Class 96 and takes separating apparatus, per se, generically disclosed or claimed for use in fluid separation or if the disclosure or a claim is restricted to liquid separation apparatus. Class 210 also takes apparatus which removes or vents gas formed incidentally to the handling of the fluid mixture or as a result of a Class 210 treatment (see particularly subclass 120, 180, 188, 218, 406, and 436). However, Class 96 takes apparatus operating to remove gas initially present in an inflowing liquid mixture, with or without liquid separation. Apparatus for the removal of a volatile organic compound (e.g., ethanol ( $C_2H_5OH$ ), gasoline, etc.) from a liquid is not taken to be apparatus for the degasification of a liquid for Class 96 when the volatile organic compound is initially present as a liquid mixed with another liquid. Apparatus for the removal of a volatile organic compound from a liquid may be found in Class 210 for liquid purification or separation or Class 202 for separatory distillation. Class 96 will also take apparatus including a liquid separation means in a Class 96 gas separation apparatus (e.g., means to regenerate a scrubbing liquid in a gas scrubbing apparatus, etc.).
- 215, Bottles and Jars, subclass 308 for closures for bottles and jars with the receptacle interior communicable with the exterior through a filter when the closure is in the applied position.
- 220, Receptacles, subclass 366 and 367+ for vents for closures for receptacles combined with gas separating means wherein the gas separator is recited by name only, or the claim includes details of the receptacle (e.g., splash plate in the receptacle or vent, etc.) or of the closure (e.g., configuration or means for attaching to the receptacle, etc.).
- 236, Automatic Temperature and Humidity Regulation, subclasses 53 through 60 for steam traps with thermostatically controlled valves.
- 239, Fluid Sprinkling, Spraying, and Diffusing, subclasses 34+ for slow diffusers, which are devices used to disperse or spread material into the ambient air without the use of draft producing means. With a disclosure of gas separation or humidity control (air conditioning), Class 239 will take, as a slow diffuser, a pad, filter, or fibrous mass that is saturated or maintained saturated with a diffusible liquid (water or volatile solvents) unless any of the following are included: (i) gas contacting means within the meaning of Class 261 (e.g., special flow arrangements through conduits or the like,



- etc.), or (ii) gas movement effecting means (e.g., pump, fan, etc.). Class 261 will take patents having the qualifications in (i) or (ii) if the filter, pad, or mass is: (a) continuously supplied with liquid, (b) cyclically or periodically moved through a liquid reservoir, (c) maintained wet by liquid applying means, or (d) moistened by maintaining some part of a continuous wick type member immersed in liquid. Class 96 will take patents having the qualifications in (i) or (ii) if the liquid supply means described in (a) through (d) is not included. An absorbent mass with oil or viscous fluid therein or supplied thereto disclosed for gas separation, or a solid or nonabsorbent sheet disclosed in a gas separating environment is not classified in Class 239, but is classifiable in either Class 96 or Class 261, depending on the nature of the liquid source. (See also the search class note to Class 261 in this section).
- 241, Solid Material Comminution or Disintegration, subclasses 68+ for apparatus for combinations of comminution and separation of solids from a gas. Class 241 is superior to the material separation classes and, therefore, provides for apparatus in which comminution is combined with means to separate the material into classes according to the physical characteristics of its components before, during, or after the comminuting operation. Class 96 takes apparatus, such as deflectors or the like, that may act to comminute material as a secondary or incidental function of what is basically a holding back or separating procedure (e.g., disintegration or attrition of ignited particles in spark arresters, etc.). Such apparatus are classified on the basis of their essential function in Class 96.
- 242, Winding, Tensioning, or Guiding, subclasses 550+ for unwinding an elongated material, and subclasses 570+ for a coil holder of general use.
- 250, Radiant Energy, subclasses 281+ for apparatus for the ionic separation of materials utilizing the charge-to-mass ratios of particles. See particularly subclasses 294+ for apparatus to subject the ionized particles to the effects of an electric or magnetic field, which causes the particles to travel through a curved trajectory, the particles of a certain charge-to-mass ratio having a trajectory different from those particles having other charge-to-mass ratios.
- 252, Compositions, subclasses 189+ for substances (e.g., liquid sorbent compositions, etc.) for use in absorbing or binding carbon monoxide (CO), sulfur (S), negative elements, or acids; subclass 193 for substances (e.g., liquid sorbent compositions, etc.) for use in absorbing or binding ammonia, alkalis, or other bases; and subclass 194 for substances (e.g., liquid sorbent compositions, etc.) for use in absorbing or binding water.
- 261, Gas and Liquid Contact Apparatus, appropriate subclasses, for apparatus for degasifying liquid (e.g., deaerating feed water heater, etc.) wherein the liquid is merely contacted with a gas in a chamber or space for deaeration thereof; for apparatus wherein a gaseous fluid mixture is contacted with a liquid spray, sheet, stream, or bath to precipitate dust or to sorb a constituent from the gaseous fluid mixture; for apparatus comprising a nonabsorbent element on which a gaseous fluid mixture is contacted with a liquid if the element is continuously supplied with a liquid or is continuously moved into and out of a liquid bath or supply; and for apparatus comprising an absorbent porous sheet or mass on which a gaseous fluid mixture is contacted with a liquid if the sheet or mass is: (a) continuously supplied with liquid, (b) cyclically or periodically moved through a liquid reservoir, (c) maintained wet by liquid applying means, or (d) moistened by maintaining some part of a continuous wick type member immersed in liquid, by following the law of the machine, or during normal operation of a gas contacting function. Note that under the provisions of (a) and (b) there must be no affirmative means to dry the sheet or mass, nor means to assure a dry condition of the sheet or mass before gas flow is resumed or the sheet or mass is returned to the gas contacting position. If apparatus for degasifying liquid by contact with a gas has other means to cause gas separation of the liquid with gas entrained therein, of the separated gas, or of the separated liquid, then the apparatus is classified in Class 96. If apparatus in which a gaseous fluid mixture is contacted with a liquid to precipitate dust or to sorb a constituent from the gaseous fluid mixture has other means to cause gas separation or has means to treat the contact liquid, then the apparatus is classified in Class 96.
- (1) Note. Apparatus for separating ammonia (NH<sub>3</sub>) or acid anhydrides (CO<sub>2</sub>, SO<sub>2</sub>, etc.) from a gas by mere contact with a liquid is classified in Class 261.



- (2) Note. Processes for gas separation by contacting a gaseous fluid mixture with a liquid and processes of degasifying a liquid are classified in Class 95.
- 266, Metallurgical Apparatus, subclasses 144+ for metallurgical apparatus combined with gas separating means and subclasses 200+ for apparatus for treating liquefied metal. See particularly subclasses 208+ for apparatus for treating liquefied metal by application of vacuum that may include degasification of the liquefied metal.
- 296, Land Vehicles: Bodies and Tops, subclasses 77.1+ for storm-front shields, aprons, or robes used to protect the occupants of vehicles from storm or wind coming from the direction in which the vehicle is moving.
- 323, Electricity: Power Supply or Regulation Systems, subclasses 220 through 354 for voltage magnitude control means not restricted to electrostatic precipitator systems.
- 363, Electric Power Conversion Systems, appropriate subclasses, especially subclasses 59+, 74+, and 100 for current rectification systems not restricted to electrostatic precipitator systems.
- 376, Induced Nuclear Reactions: Processes, Systems, and Elements, for apparatus for induced nuclear reactions combined with means for reaction product treatment. See particularly subclasses 146+, 189, 195, 198, and 201. See subclasses 308+ for apparatus including fission reactor material treatment and subclasses 370+ for reactor structures with means for separation of a vapor.
- 383, Flexible Bags, subclasses 42+ for bag closures and appropriate subclasses for bags not used as filter bags for gas separation.
- 406, Conveyors: Fluid Current, subclasses 154+ for apparatus to convey solid material in a fluid current with means to separate the solids from the fluid at the conveyor outlet.
- 415, Rotary Kinetic Fluid Motors or Pumps, subclass 121.2 for a pump or motor combined with means to separate solids from a gaseous working fluid and subclasses 169.2+ for a pump or motor combined with means to separate moisture vapor or liquid from a gaseous working fluid.
- 417, Pumps, appropriate subclasses for pumps combined with upstream filtering or separating means specifically disclosed as protecting the pump and also for pumps combined with separators if any of the separated constituents are

fed back or applied to the pump. This includes, for example, lubricant, coolant, or an impelling fluid which is separated from an impelled fluid, as in a jet pump. Class 417 takes jet pumps for flues combined with a spark arrester, because the combination of a jet pump and a spark arrester is considered to be a perfecting feature of the pump. See Class 417, subclass 156.

- (1) Note. A system for evacuating a space and in which a trap is included for preventing back-streaming or back-migration of molecules from a pumping area to the space being evacuated and which operates in the manner of a Class 96 gas separator will be considered a gas separator whether or not the apparatus is so identified. It will be noted that with the trap positioned between the space and the pump, separation would occur with gas flowing in either direction (i.e., from the space to the pump or from the pump to the space), if the fluid is separable.

Classification of the different combinations which may be claimed is as follows: (a) A Class 96 type trap or separator, per se, identified either as a pump or a separator is classified in Class 96. (b) A separator or molecule trap of the Class 96 type combined with a pump to evacuate space is classified in Class 96 unless there is some specific relationship between the separator or trap and the pump (other than the mere pumping of the fluid to and through the trap). As a nonlimiting example, if the separated material is conducted to a pump element for lubrication, cooling, etc., then classification is in Class 417. (c) A separator or molecule trap of the Class 96 type combined with a pump and a space being evacuated is classified in Class 96 unless there is some special separable connection of the type recognized in Class 141 for receiver coaction, in which case classification is in Class 141, regardless of any interrelationship between the pump and the separator or trap as set forth in (b) above. (d) A pump claimed in combination with nominally claimed filter or separator will be classified in Class 417. (a), (b), and (c) do not take into account the combination with heat exchanging or refrigerating means provided for in Classes 62 and 165,



- for which see the search class notes set out in other parts of this section.
- 418, Rotary Expansible Chamber Devices, for rotary expansible chamber type pumps. The line between Class 96 and Class 418 is the same as set forth above for Class 417.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, for apparatus for (a) carrying out chemical reactions, (b) preparing or treating chemical compounds or compositions, even though only a physical reaction is discernible, and (c) performing an analysis which involves either a chemical reaction or a physical reaction not elsewhere provided for. See subclasses 88+ for apparatus for quantitative or qualitative chemical analysis of a gas sample including means for absorbing or adsorbing the gas sample or that portion to be tested into or onto liquid or solid media. See subclasses 120+ for apparatus for (a) taking the odor out of or masking the odor of or (b) chemical purification of a life-sustaining environmental gas (for breathing apparatus) or the chemical generation of the same. See subclasses 168+ for apparatus for the modification of a waste gas, prior to its discharge into the atmosphere, by chemical reaction to reduce the pollutant content thereof. Class 96 takes the combination of preserving, disinfecting, or sterilizing means and gas separation means of the type that meets the requirements for gas separation apparatus in the definition for Class 96. The gas separating means may be claimed by name only, provided such named device is disclosed as being more than a mere supporting or treating means for a preserving, disinfecting, or sterilizing substance (see, e.g., Class 96, subclasses 223+).
- 428, Stock Material or Miscellaneous Articles, appropriate subclasses for stock material which may inherently perform a gas separating function (e.g., a structurally defined web or sheet including apertures, etc.). However, stock material when positively stated as being for gas separation will be found in Class 96 (see Class 55, subclasses 522+).
- 435, Chemistry: Molecular Biology and Microbiology, subclasses 283.1+ for apparatus claimed or solely disclosed for using a microorganism or enzyme to synthesize a chemical product or for treating a material with a microorganism or enzyme to separate, liberate, or purify a preexisting substance.
- 451, Abrading, subclass 453 for an accessory usable with abrading means for collecting particles coming from a grinding wheel or work during operation of the grinding wheel.
- 454, Ventilation, appropriate subclasses for ventilated structures, per se, or combined with a gas separating operation. Class 454 includes devices such as screens or gridlike members (e.g., bird screens, etc.), chimney caps, diffusion type air registers, hoods, offtakes, louvers, and pipe caps which function to control rather than to separate gas.
- 493, Manufacturing Container or Tube From Paper; or Other Manufacturing From a Sheet or Web, subclasses 39+ for cigarette filter making methods or apparatus; see especially subclasses 47+ for methods or apparatus to assemble dissimilar filter materials (e.g., fiber and powdered charcoal, etc.) and subclass 941 for a cross-reference art collection for operations involving the construction of a filter.
- 494, Imperforate Bowl: Centrifugal Separators, for apparatus for the breaking up or subdividing of material, which material comprises a mixture of fluids or fluent substances, into two or more components by utilizing a rotatable, receptacle-like member having a generally solid wall, and commonly termed a bowl, for subjecting the material to centrifugal force. Thus, gas separation apparatus that is an imperforate bowl, centrifugal separator is proper for Class 494.
- 502, Catalyst, Solid Sorbent, or Support Therefor: Product or Process of Making, subclasses 60+ for zeolite compositions, per se, and for processes of making zeolite compositions, and subclasses 400+ for other solid sorbent compositions, per se, and for processes of making solid sorbent compositions. Class 502 will take zeolite or other solid sorbent compositions having details of the physical characteristics of the composition itself (e.g., porosity, particle size, etc.). Class 502 will also take zeolite or other solid sorbent compositions that are layered, laminated, or otherwise affixed to another zeolite or other solid sorbent composition or to a support material. Class 96 takes apparatus having (a) an inlet for the fluid mixture to be treated, (b) a means effective to cause separation into constituent parts, and (c) an outlet for at least one constituent separate and distinct from an outlet for another constituent or a single outlet used at different times to remove the separated constituents. The means effective to cause separation into constituent parts confines



the zeolite or other solid sorbent composition inside an enclosure that contains the fluid mixture being separated. Class 96 also takes filter elements having zeolite or other solid sorbent compositions held in an open structure or rim that encases, holds, or borders the zeolite or other solid sorbent composition or held on a skeletal structure.

## SECTION V - GLOSSARY

### CHARGE GAS, GAS, OR SYSTEM FLUID

(Terms used in Class 55 subclass titles and definitions). These terms are used synonymously and mean the inlet mixture of gas carrying therein solids or fluids, the mixture during separation, or a gaseous constituent after separation.

### DETECT

The term “detect,” which is used in many of the control subclasses, is used in both a quantitative and a qualitative sense. This means that a definite measurement of a process variable is made (e.g., temperature, pressure, concentration, etc.) or that the presence of a particular event is determined (e.g., presence of sparking, change in liquid level determined by position of float, etc.).

### FILTER

An article or mass of material made of closely spaced or intimately arranged intermeshed or unconnected fibers, elements, strands, or particles that collectively act as a barrier to physically retain at least one constituent of a fluid mixture on its surfaces or in the spaces between the fibers, elements, strands, or particles while permitting passage of the remaining constituents.

A filter has no “chemical” affinity for a constituent of a fluid mixture. The retention of the constituent by the filter depends upon a mechanical entrapment of solid or liquid particles because of their relatively large size compared with the interstices or spaces between individual fibers, elements, strands, or particles. The retained particles can be removed by brushing, wiping, shaking, or similar mechanical action.

### FLUID MIXTURE

The phrase “fluid mixture” is used throughout the definitions to mean (a) a gas and solid or liquid particles

entrained therein, (b) a liquid and gas entrained therein, or (c) a plurality of gases.

### GAS

Matter of very low density and viscosity, relatively great expansion and contraction, with changes in pressure and temperature, that is readily diffusive, with a tendency to expand indefinitely, with molecules in free movement. The term “gas” includes “vapor” (q.v.).

### GASEOUS FLUID MIXTURE

The phrase “gaseous fluid mixture” is used throughout the definitions to mean (a) a gas and solid or liquid particles entrained therein or (b) a plurality of gases.

### LIQUID SORBENT

A liquid capable of retaining part of a fluid mixture with which it is contacted. The action in most cases is that of selective retention (i.e., the sorbent removes only that part of the fluid mixture for which it has the greatest affinity).

### REGENERATION

Restoration of the separatory material to the condition it was in before the separatory process.

### SEPARATING APPARATUS

The entire gas separating means, which consists of all of the apparatus parts related to gas separation and includes apparatus parts that are in addition to the separator.

### SEPARATING MEDIUM (MEDIA)

Liquid sorbent or means that effects the separation into constituent parts (e.g., deflector, filter, molecular sieve, sorber, etc.). (Media has been used in the singular and in the plural.)

### SEPARATOR

The portion of the apparatus that consists of a separating medium and the structure supporting, retaining, or substantially confining the separating medium.

### SOLID SORBENT

A solid sorbent is a solid material which separates a constituent (e.g., a gas, vapor, etc.) from a fluid mixture



containing such constituents in a “quasi-chemical” manner. The action in most instances is that of selective retention (i.e., the sorbent removes only the part of the fluid mixture for which it has the greatest affinity). The retained constituent cannot be removed by shaking, brushing, or similar mechanical action, but generally can be removed by heating, pressure reduction, or use of a stripping or denuding fluid.

#### TREATMENT

(a) With respect to the class subject matter, the term is restricted to reversible and nonchemical changes in physical characteristics of the fluid mixture or a separated constituent (e.g., heating, cooling, humidity control, agitating, pressure regulation, etc.). (b) With respect to the media used to perform the gas separation or to a material used to condition the fluid mixture for separation, the term may include chemical preparation, reconditioning, or reaction.

#### VAPOR

The gaseous state of matter that is liquid or solid under a temperature of 0°C and pressure of 760 mm Hg.

#### SUBCLASSES

##### 1 MAGNETIC SEPARATING MEANS:

This subclass is indented under the class definition. Apparatus having means to produce magnetic lines of force in order to separate a constituent or to aid the separation of a constituent from a fluid mixture.

- (1) Note. The means may be either a permanent magnet or an electromagnet.

##### SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclasses 43+ for a process using the selective diffusion of gases through a solid, liquid, or gaseous barrier, such as a semipermeable membrane.
- 210, Liquid Purification or Separation, subclass 96.2, 257.2, and 321.6+ for apparatus having membranes or dialyzers for separating liquids and subclasses 500.21+ for semipermeable membranes used in the separation of liquids.
- 215, Bottles and Jars, subclass 261 for closures for bottles and jars having a bar-

rier permeable to gas and impermeable to liquid.

##### 5 Immobilized liquid membrane:

This subclass is indented under subclass 4. Apparatus in which the barrier to gas diffusion is a liquid that is supported or immobilized in or on a porous medium.

##### SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 44 for corresponding processes. Patents are not cross-referenced from Class 95, subclass 44 to this subclass based only on disclosure. Therefore, relevant disclosures of gas separation apparatus may be found in the process area.

##### 6 Membrane to degasify liquid:

This subclass is indented under subclass 4. Apparatus which is used to separate gas entrained in a liquid (e.g., by selectively allowing the gas to pass through a barrier, such as a membrane, etc.).

##### SEE OR SEARCH THIS CLASS, SUBCLASS:

- 155+, for apparatus effecting the degasification of a liquid without utilizing the selective diffusion of gases.

##### SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 46 for corresponding processes. Patents are not cross-referenced from Class 95, subclass 46 to this subclass based only on disclosure. Therefore, relevant disclosures of gas separation apparatus may be found in the process area.

##### 7 Plural separate barriers:

This subclass is indented under subclass 4. Apparatus comprising two or more distinctly separate barriers (e.g., membrane stack, etc.).

##### 8 Parallel hollow fibers or cylinders (e.g., bundled, etc.):

This subclass is indented under subclass 7. Apparatus comprising a plurality of hollow fibers or cylinders, where the hollow fibers or cylinders are usually small-diameter tubes bundled for parallel gas flow.



## SEE OR SEARCH CLASS:

210, Liquid Purification or Separation, subclass 323.2 for plural distinct tubular separators and subclass 500.23 for hollow fibers or cylindrical semipermeable membranes used in the purifying or separating of liquids.

**9 Barriers connected in series:**

This subclass is indented under subclass 7. Apparatus in which at least two separate barriers are arranged in series for sequential gas diffusion or separation.

**10 Hollow fiber or cylinder:**

This subclass is indented under subclass 4. Apparatus in which the gas is diffused through the wall of a hollow fiber or cylinder (e.g., tube, etc.).

## SEE OR SEARCH CLASS:

210, Liquid Purification or Separation, subclass 500.23 for hollow fibers or cylindrical semipermeable membranes used to purify or separate liquids.

**11 Plural layers (e.g., laminated barrier, etc.):**

This subclass is indented under subclass 4. Apparatus in which the barrier for gas diffusion comprises two or more distinguishable layers.

- (1) Note. The layers or laminates may be of similar composition. Where the barrier has been formed by evaporation of one or more components to result in a surface layer depleted in these components and the surface layer is distinguishable from the remaining barrier thickness upon subsequent inspection, the barrier is taken to be composed of at least two distinguishable layers.
- (2) Note. Plural layer (or laminated) membranes are often referred to as composites. However, the use of this term as applied to classification in this subclass does not include a single porous barrier material impregnated with a second material unless enough of the second material remains on the exterior of the single porous barrier material to form a distinguishable coating or second layer.

**12 Organic compound containing layer:**

This subclass is indented under subclass 11. Apparatus in which at least one of the distinguishable layers contains an organic compound.

## SEE OR SEARCH CLASS:

210, Liquid Purification or Separation, subclasses 500.27+ for semipermeable membranes containing an organic compound which are used for purifying or separating liquids.

**13 Ring containing organic compound:**

This subclass is indented under subclass 12. Apparatus in which at least one of the distinguishable layers contains an organic compound that is cyclic.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

14, for gas diffusion membranes composed of a single layer and having at least one ring containing organic compound.

## SEE OR SEARCH CLASS:

210, Liquid Purification or Separation, subclasses 500.28+ for semipermeable membranes containing a cyclic organic compound which are used for purifying or separating liquids.

**14 Membrane having ring containing organic compound:**

This subclass is indented under subclass 4. Apparatus in which the barrier has at least one cyclic or ring containing organic compound.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

13, for gas diffusion apparatus with plural layers in which at least one of such layers has a ring containing organic compound.

## SEE OR SEARCH CLASS:

210, Liquid Purification or Separation, subclasses 500.28+ for semipermeable membranes containing a cyclic organic compound which are used for purifying or separating liquids.



**15 ELECTRIC FIELD SEPARATION APPARATUS (E.G., ELECTRICAL PRECIPITATOR, ELECTROSTATIC TYPE, ETC.):**

This subclass is indented under the class definition. Apparatus in which a constituent of the fluid mixture is separated or precipitated by an electric field or discharge means and includes an electrode arranged to emit, collect, or control movement of charged particles (e.g., electrical or Cottrell precipitators, electrostatic type, etc.); and subcombinations thereof (e.g., electrodes for such apparatus, etc.).

- (1) Note. Treatment by an electric field to agglomerate or coalesce constituents of the fluid mixture, where no provision for separation or precipitation, as such, is described, is classified in this subclass if the disclosure relates to gas separation and the ultimate use of the apparatus is for gas separation.
- (2) Note. This subclass is the collecting home for means for insuring nonconducting properties of the apparatus, other than mere conductor sheath. Thus, patents claiming such means with only nominal recitation of other features are classified in this subclass rather than the indented subclasses, and other patents with significant disclosures of such means are cross-referenced to this subclass. However, patents concerning insulation and having a disclosure or claims pertaining to electrode retaining or supporting means are not placed in this subclass but are found in subclass 88.
- (3) Note. The line between Class 96 and the applicable electrical classes is based on the amount of disclosure. If there is a general utility or multiple purpose disclosure and the claims are not limited to electric field separation apparatus for this class (such as by including precipitator electrodes), then classification is in the appropriate other class.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 3, for electric field separation apparatus combined with magnetic separating means.

88, for insulation features combined with electrode retaining or supporting means.

223+, for gas separation apparatus combined with sterilizing means.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclasses 57+ for processes involving an electric field for separating fluid mixtures.
- 174, Electricity: Conductors and Insulators, subclasses 137+ for insulators.
- 204, Chemistry: Electrical and Wave Energy, appropriate subclasses; particularly 660+ for similar apparatus dealing with the electrical separation of liquids and degasification of liquid aided by electrical discharge involving the conversion of constituents to other compounds. When such chemical conversion is in doubt, placement of electrical apparatus for degasifying liquid is proper for Class 96.
- 210, Liquid Purification or Separation, subclass 243 for liquid separation apparatus with electrical insulating or electricity discharging means.
- 250, Radiant Energy, subclasses 281+ for processes and apparatus for separating ionized material based on the differing charge-to-mass ratios of such material.
- 313, Electric Lamp and Discharge Devices, appropriate subclasses for electric space discharge devices, especially subclasses 231.01+ for such discharge devices which have means for passing a fluent material between the discharge electrodes.
- 315, Electric Lamp and Discharge Devices: Systems, appropriate subclasses for miscellaneous systems for supplying electrical energy to electric space discharge devices of the gas or vapor ionization type.
- 327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, appropriate subclasses and particularly subclasses 530+ for miscellaneous circuits having a specific source of supply or bias voltage.



361, Electricity: Electrical Systems and Devices, subclasses 227+ for particle charging means and 230+ for ionizing means which are not solely disclosed in connection with the separation of a gaseous fluid mixture.

422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 22+ for processes of disinfecting, deodorizing, preserving, or sterilizing using direct contact with electrical or electromagnetic radiation, and subclasses 186.04+ for electrostatic field or electrical discharge apparatus for chemical treatment not combined or associated with gas separation apparatus of the type found in Class 96, subclasses 223+. Also, see the search class note to Class 422 at the beginning of this class.

**16 And radioactive or ultraviolet light ionizer:**  
This subclass is indented under subclass 15. Apparatus having means to ionize a gaseous fluid mixture either by radioactive or ultraviolet light means.

SEE OR SEARCH THIS CLASS, SUBCLASS:

223+, for nonelectrical separation apparatus combined with sterilizing means.

**17 Electric charge produced by friction (e.g., by gas flow, etc.):**

This subclass is indented under subclass 15. Apparatus in which electrification of a separator part is accomplished by friction between two solid bodies or by flow of gas across or through a solid.

(1) Note. Placing a member in an electric field to charge such member is not included in this subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

16, for electric field separation apparatus including radioactive or ultraviolet light ionizers.

80+, for electric field separation apparatus with voltage supply means or circuitry.

SEE OR SEARCH CLASS:

55, Gas Separation, subclass 360 for means to ground a filter and serving to prevent shock hazard, the static electricity having no precipitating or separating function.

310, Electrical Generator or Motor Structure, subclasses 308+; particularly subclass 310 for charge accumulating electrostatic generators of the friction type.

**18 With control means responsive to sensed condition:**

This subclass is indented under subclass 15. Apparatus in which means are provided to detect an apparatus or a process characteristic or change therein and to control or regulate operation of the apparatus or process based on the detected characteristic or change therein.

(1) Note. In this subclass and the subclasses indented hereunder, a single means may be used both to detect the characteristic or a change therein and to implement an action in the apparatus based upon the detected characteristic or change therein. There must be a positive action made by the apparatus because of the detected characteristic or change therein. An example is a pressure relief valve in which a certain pressure must be reached before the valve opens to relieve pressure differential across the valve. Another example is a thermostat with a bimetallic element in which a certain temperature must be reached before the element is deformed enough to trip a switch, thus implementing a control action in the apparatus as a result of the temperature or change therein. Apparatus in which no positive action is made by the single means as a result of the detected characteristic or change therein is not classified in this subclass or in the subclasses indented hereunder, but is classified below. An example of such means would be an ammeter for recording spikes in electric current to denote sparking events, but without means for implementing any reaction in the apparatus (e.g., to reduce electrode voltage, etc.) as a result of such current spikes.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 25, for electric field separation apparatus with programmed, cyclic, or time responsive control means not responsive to a sensed condition.
- 26, for electric field separation apparatus with measuring, indicating, signal, or alarm means.
- 30+, for electric field separation apparatus with cleaner and interrelated shut-down or voltage adjustment means.
- 80+, for electric field separation apparatus with voltage supply or circuitry which is not specifically used to control operation of the apparatus.
- 102, for chromatography type apparatus with control means responsive to sensed condition.
- 109+, for solid sorbent apparatus with control means responsive to sensed condition.
- 156+, for apparatus degasifying liquid with control means responsive to sensed condition.
- 397+, for gas separation apparatus with automatic control means for gas or nongaseous constituent discharge and subclasses 417+ for gas separation apparatus with signals, indicators, measuring, or testing means.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclasses 2+ for electric field separation processes with control responsive to sensed condition, subclass 25 for processes with recording or signaling condition, and subclass 26 for processes with timing of operation.
- 340, Communications: Electrical, subclasses 500+ for automatic electrical condition responsive indicating systems; particularly subclasses 632+ for gas responsive devices.

**19 Concentration or temperature sensing means:**

This subclass is indented under subclass 18. Apparatus in which means are provided to detect the amount of a constituent present (e.g., dust, humidity, etc.) or a change therein in the fluid mixture or the temperature or a change

therein of the fluid mixture under treatment and to control or regulate the operation of the apparatus based on the detected characteristic or change therein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 407, for gas separation apparatus having temperature or humidity responsive automatic control means for gas or nongaseous constituent discharge.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 3 and 4 for corresponding processes with control responsive to concentration and temperature, respectively; subclasses 8+ and 14+ for nonelectrical separation processes with control responsive to concentration and temperature, respectively.
- 236, Automatic Temperature and Humidity Regulation, for automatic temperature or humidity control means, per se.

**20**

**Arc, spark, or flashover sensing means:**

This subclass is indented under subclass 18. Apparatus in which means are provided to detect the presence or frequency of sparking discharge in the gaseous fluid mixture (e.g., arc or flashover of current bursts between differently charged parts, such as between discharge and collector electrodes, etc.) and to control or regulate the apparatus based on the detected sparking.

- (1) Note. A sparking event or its frequency may be detected indirectly (e.g., by detecting short bursts of increasing system electrical current or decreasing electrode voltage, etc.), but must be specifically claimed to be classified in this subclass.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 5 for electric field separation processes with control responsive to sensed sparking.

**21**

**Current sensing means:**

This subclass is indented under subclass 20. Apparatus in which means are provided to detect electrical current or a change therein and



to control or regulate the operation of the apparatus based on the detected electrical current or change therein.

SEE OR SEARCH THIS CLASS, SUBCLASS:

22, for electric field separation apparatus with control means responsive to electrical current, but without means responsive to arc, spark, or flashover.

22

**Current sensing means:**

This subclass is indented under subclass 18. Apparatus in which means are provided to detect electrical current or a change therein and to control or regulate the operation of the apparatus based on the detected electrical current or change therein.

SEE OR SEARCH THIS CLASS, SUBCLASS:

21, for electric field separation apparatus with control means responsive to arc, spark, or flashover and also responsive to electrical current.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass 6 for corresponding processes with control responsive to sensed electrical current.

23

**And voltage sensing means:**

This subclass is indented under subclass 22. Apparatus in which means are provided to detect voltage or a change therein and to control or regulate the operation of the apparatus based on the detected voltage or change therein.

SEE OR SEARCH THIS CLASS, SUBCLASS:

24, for electric field separation apparatus with control means responsive to voltage, but without means responsive to arc, spark, flashover, or electrical current.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass 7 for electric field separation processes with control responsive to sensed voltage.

24

**Voltage sensing means:**

This subclass is indented under subclass 18. Apparatus in which means are provided to detect electrode voltage or a change therein and to control or regulate the apparatus based on the detected voltage or change therein.

SEE OR SEARCH THIS CLASS, SUBCLASS:

23, for electric field separation apparatus with control means responsive to voltage and electrical current.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass 7 for electric field separation processes with control responsive to sensed voltage.

25

**With programmed, cyclic, or time responsive control means:**

This subclass is indented under subclass 15. Apparatus which is provided with control means not directly responsive to a sensed condition for (a) storing coded instructions or other data necessary to regulate operation of the treating apparatus, (b) repetitively regulating a sequence of operational steps performed in or by the treating apparatus, or (c) causing various system operations to occur according to preset timing sequences or to last for predetermined durations (e.g., timer switches, etc.).

(1) Note. This subclass includes any control means which maintains an operating condition, predetermines apparatus operation, or regulates repetition.

SEE OR SEARCH THIS CLASS, SUBCLASS:

18+, for electric field separation apparatus with control means responsive to sensed condition.

26, for electric field separation apparatus with measuring, indicating, signal, or alarm means.

30+, for electric field separation apparatus with cleaner and interrelated shutdown adjustment means; particularly subclass 31, including means for sequential operation.

80+, for electric field separation apparatus with voltage supply or circuitry which



- is not specifically used to control operation of the apparatus.
- 103, for chromatography type separation apparatus with programmed, cyclic, or time responsive control means.
- 115+, for solid sorbent apparatus with programmed, cyclic, or time responsive control means.
- 424+, for nonelectrical gas separation apparatus with timing or changeable programming means.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclass 26 for gas separation processes with timing of operation.

**26**

**With indicating, signal, or alarm means:**

This subclass is indented under subclass 15. Apparatus which is provided with means to indicate a characteristic or change therein (e.g., of the fluid mixture, a separated constituent, or the apparatus, etc.); or means to signal or alert the status of such a characteristic.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 18+, for electric field separation apparatus with control means responsive to sensed condition.
- 25, for electric field separation apparatus with programmed, cyclic, or time responsive control means.
- 117, for solid sorbent apparatus with indicating, signal, or alarm means combined with programmed, cyclic, or time responsive control means.
- 417+, for gas separation apparatus with signals, indicators, measuring, or testing means.

**SEE OR SEARCH CLASS:**

- 73, Measuring and Testing, for measuring and testing procedures and apparatus.
- 95, Gas Separation: Processes, subclass 25 for gas treating processes with recording or signaling condition.
- 116, Signals and Indicators, particularly subclasses 67+ for alarms and 200+ for indicators.

- 374, Thermal Measuring and Testing, for thermal measuring methods and devices, particularly subclasses 100+ for thermometers and similar devices.

**27**

**With means to add charged solid or liquid particles to gaseous fluid mixture:**

This subclass is indented under subclass 15. Apparatus which has means for commingling a solid or liquid agent carrying an electrical charge with the gaseous fluid mixture being separated, where the solid or liquid agent ionizes, agglomerates, or collects constituents of the mixture or otherwise electrically treats the gaseous fluid mixture.

- (1) Note. Apparatus including a charged fluidized bed for treatment of the gaseous fluid mixture is also found in this subclass.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 44+, for electric field separation apparatus with wet film type electrodes in which liquid is directly applied to an electrode rather than being introduced into the gaseous fluid mixture as charged discrete liquid particles.
- 52+, for electric field separation apparatus with means for vapor or liquid contact to treat a gaseous fluid mixture or a separated constituent.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclasses 58+ for electric field separation processes with addition of solid, gas, or vapor to the gaseous fluid mixture; subclasses 64+ for electric field separation processes including separation by liquid addition to the gaseous fluid mixture; and subclasses 71+ for electric field separation processes with addition of liquid to the fluid mixture.
- 361, Electricity: Electrical Systems and Devices, subclasses 227+ for means charging particles (e.g., fluid spray, etc.), and see the search note included there for other fields of search.



**28 Electrode cleaner, apparatus part flusher, discharger, or wet collector (e.g., wet film electrode, etc.):**

This subclass is indented under subclass 15. Apparatus which has (a) means to remove the constituent gathered on an electrode, (b) means to remove the separated constituent by air draft, suction, liquid, or positively acting discharging means from parts other than electrodes of the apparatus, or (c) means to provide a bath type collector or a moving liquid film for the surface of a collecting electrode.

- (1) Note. The constituent which has been separated is usually nongaseous and adheres to the electrodes or has fallen therefrom onto a collecting means (e.g., a series of shelves, etc.).
- (2) Note. A collector electrode with a moving liquid film thereon is included herein (see subclass 45 in particular) since a cleaning action is inherent during passage of the liquid film over the electrode, even though the cleaning action may not be specifically disclosed.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 228+, for nonelectrical gas separation apparatus with means using liquid to clean the separating apparatus.
- 243+, for nonelectrical gas separation apparatus with gas and liquid contact means.

SEE OR SEARCH CLASS:

- 15, Brushing, Scrubbing, and General Cleaning, for cleaning means of various types not specific to electric field separation apparatus.
- 55, Gas Separation, subclasses 282+ for nonelectrical separating apparatus with means to clean a separating medium.
- 95, Gas Separation: Processes, subclasses 74+ for electrical separation processes including cleaning of a collector electrode.
- 134, Cleaning and Liquid Contact With Solids, for various cleaning processes and apparatus, not specific to electric field separation apparatus.

**29 Electrode or part thereof moved on or against another:**

This subclass is indented under subclass 28. Apparatus arranged so that electrodes (discharge or collector) or parts thereof, in the case of sectionalized members, can move on or rub against each other or contact each other (e.g., by scraping or knocking against one another, etc.).

**30 With shutdown or voltage adjustment means interrelated with cleaning (e.g., cutting off flow of gaseous fluid mixture or electrical current, etc.):**

This subclass is indented under subclass 28. Apparatus having an interlock, electrical control, or blocking means (a) preventing normal operation of the apparatus or section thereof, as by cutting off or diverting the flow of gaseous fluid mixture or (b) disconnecting or effectively changing the voltage in an electrical circuit to the apparatus or section thereof, while the electrode cleaner is operating.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 80+, for apparatus with details of voltage supply means or circuitry not specifically interrelated with cleaning.

**31 Sequential operation:**

This subclass is indented under subclass 30. Apparatus having means for cleaning the apparatus in sequence with shutdown or voltage adjustment.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 25, for electrical separation apparatus with programmed, cyclic, or time responsive control means.

**32 Vibrating, jarring, or rapping means:**

This subclass is indented under subclass 28. Apparatus having means to shake, jar, or set into a motion of small amplitude and relatively high frequency the electrode itself or its supporting means.

SEE OR SEARCH CLASS:

- 55, Gas Separation, subclass 300 for nonelectrical separation apparatus with



- vibrating, jarring, or rapping means for cleaning separating media.
- 95, Gas Separation: Processes, subclass 76 for electrical separation processes with electrode cleaning by scraping or vibrating.
- 33 Mounted on rotatable shaft (e.g., swinging arm or hammer, etc.):**  
This subclass is indented under subclass 32. Apparatus in which the vibrating, jarring, or rapping means is attached to a rotatable shaft (e.g., swinging arm or hammer, etc.) and is used to strike the electrode or its support or in some other way transfer impact so that collected constituents are dislodged from the electrode.
- 34 Having reciprocating rod or piston type activating or rapping means:**  
This subclass is indented under subclass 33. Apparatus in which a rod or piston is activated by or used to activate a rotatable means to accomplish transfer of an impact so that collected constituents are dislodged from the electrode.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
37, for reciprocating rod or piston type activating or rapping means not combined with rotatable means.
- 35 Activated by second swinging or rotatable means:**  
This subclass is indented under subclass 33. Apparatus in which a shaft-mounted swinging or rotating means is caused to transfer vibration or impact to the electrode by motion of a second swinging or rotating means.
- 36 Magnet or solenoid activating means:**  
This subclass is indented under subclass 32. Apparatus in which a magnetic or electromagnetic means is used to induce vibration of the electrode or cause a second means to jar or rap the electrode or its support means, so that a collected constituent is removed.
- SEE OR SEARCH CLASS:  
335, Electricity: Magnetically Operated Switches, Magnets, and Electromagnets, subclasses 255+ for magneto-mechanical devices of the core arma-
- ture type for use as a rapping or jarring means for electrostatic precipitators, but not solely disclosed for use therein.
- 37 Reciprocating rod or piston type activating or rapping means:**  
This subclass is indented under subclass 32. Apparatus in which a rod or piston is moved in an axial direction to strike the electrode or to activate a second means to rap the electrode, so that a collected constituent is removed.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
34, for reciprocating rod or piston type activating or rapping means combined with rotatable means.
- 38 Horizontal striking means:**  
This subclass is indented under subclass 32. Apparatus in which means are provided to strike the electrode or its support means horizontally, in order to dislodge a collected constituent.
- 39 Movably mounted electrode:**  
This subclass is indented under subclass 28. Apparatus wherein the electrode is supported for movement relative to the apparatus either to effect or perfect cleaning of the apparatus.
- (1) Note. There may be a plurality of electrodes, each being moved separately at the time of cleaning.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
93, for electric field separation apparatus with nonrigid support means for collector electrode.
- SEE OR SEARCH CLASS:  
55, Gas Separation, subclass 400 for non-electrical separation apparatus with means mounted or supported for continuous motion.  
95, Gas Separation: Processes, subclass 77 for electric field separation processes involving a continuously moving electrode.



**40 Nonliquid contact cleaning means:**

This subclass is indented under subclass 39. Apparatus in which the cleaning is accomplished by contact of the electrode with either a solid or gaseous agent.

**41 Liquid bath for immersion of electrode:**

This subclass is indented under subclass 39. Apparatus in which the movable electrode is dipped or partially dipped into a reservoir or body of liquid.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

231, for nonelectrical gas separation apparatus with liquid immersion cleaning means for separating media.

**42 Endless belt carried or belt type electrode:**

This subclass is indented under subclass 41. Apparatus in which the movable electrode comprises (a) an electrode means affixed to a continuous running length member or (b) a running length (e.g., web, etc.) or belt type electrode.

**43 Fluid contacting means (e.g., suction means, etc.):**

This subclass is indented under subclass 28. Apparatus in which cleaning is accomplished by causing a nonsolid agent to contact the electrode or an apparatus part (e.g., by vacuum means, etc.) to remove a collected constituent.

(1) Note. The agent may be the gaseous fluid mixture from which the constituent is being removed or a gaseous fluid from which the constituent has been separated if applied to a part to be cleaned by pressure or suction means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

228+, for nonelectrical gas separation apparatus with means using liquid to clean the separating apparatus.

**44 Liquid applying means for electrode (e.g., projection type, etc.):**

This subclass is indented under subclass 43. Apparatus in which a liquid is brought into contact with electrode means to move thereon, whereby cleaning is effected.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

27, for electric field separation apparatus having means to add charged solid or liquid particles to the gaseous fluid mixture.

52+, for electric field separation apparatus with means to treat a gaseous fluid by contacting it with a vapor or liquid.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass 75 for electric field separation processes with electrode cleaning by liquid flushing.

**45 Weir or overflow wet film type:**

This subclass is indented under subclass 44. Apparatus having means to apply liquid to the electrode by permitting a supply of liquid to run over the retaining walls therefor and down over the electrode in overflowing fashion (as contrasted, for example, with immersion or projection spraying).

(1) Note. This subclass includes collector electrodes, per se (e.g., not claiming liquid supply means), defining structure limited or peculiar to liquid control either to wash down the electrode or to supply liquid to provide a film or wet-surfaced electrode.

**46 Having movable spraying means for liquid:**

This subclass is indented under subclass 44. Apparatus in which spray nozzles or other movable means are mounted for movement to distribute liquid across the electrode.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

281+, for nonelectrical gas separation apparatus with movably mounted liquid distributor.

**47 Including means to recirculate liquid:**

This subclass is indented under subclass 44. Apparatus in which a flow path is provided to recycle at least a portion of the liquid used to wash the electrode.



**48 Including baffle for directing gas flow:**

This subclass is indented under subclass 44. Apparatus in which a baffle or deflector is arranged to funnel or redirect gas flow.

- (1) Note. The treatment casing walls are not considered to serve as baffling means; in order to be classified in this subclass, additional baffle or deflector means must be arranged to affect gas flow.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 64, for electric field separation apparatus with perforated baffle or gas diffuser for contact with ionizing electrode or uniform flow in treating zone.

SEE OR SEARCH CLASS:

- 55, Gas Separation, subclasses 434+ for nonelectrical separation apparatus with deflector or impingement baffle.  
95, Gas Separation: Processes, subclass 78 for electric field separation processes using baffling, deflection, or restriction of gas flow.

**49 Cylindrical electrode:**

This subclass is indented under subclass 44. Apparatus in which at least one electrode is formed in the shape of a cylinder.

**50 Apparatus purging or flushing means using gas or liquid:**

This subclass is indented under subclass 43. Apparatus in which gas or liquid is brought into contact with an apparatus part other than the electrodes (e.g., as in wet bottom precipitators, etc.) in order to effect cleaning.

- (1) Note. This definition includes apparatus in which a gas draft of high volume is pumped through the apparatus to sweep it clean of accumulated deposits without special contact means expressly arranged for the electrodes.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 43, for electric field separation apparatus including special means expressly arranged to contact an electrode with cleaning gas.

**51 Electrode scraping, brushing, or wiping means:**

This subclass is indented under subclass 28. Apparatus having a solid agent for contacting the electrode to remove encrustation or residue.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 40, for electrodes moved against brushes, scrapers, or wipers for cleaning.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 76 for electric field separation processes involving constituent removal from collector electrodes.

**52 With means for vapor or liquid contact (e.g., for gas separation, cooling, conditioning, etc.):**

This subclass is indented under subclass 15. Apparatus having means to treat a gaseous fluid mixture or a separated constituent by contact with a liquid or vapor (e.g., for separation, heating, cooling, or conditioning, etc.).

- (1) Note. Means to apply a fluid viscid coating or conditioning agent to electrodes are included, where the coating is substantially stationary, for the purpose of treating the gaseous fluid mixture or separated constituent.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 41+, for electrode immersion means wherein the cleaning means may include a liquid useful for separation, such as a viscous liquid.  
44+, for liquid applying means and weir or overflow wet film type electrodes wherein the liquid is applied for cleaning.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclasses 58+, 63+, and 71+ for electric field separation processes involving the addition of gas, vapor, or liquid to the gaseous fluid mixture under treatment.



- 53 Liquid spray means:**  
This subclass is indented under subclass 52. Apparatus in which means are provided to distribute or spray liquid in the gaseous fluid mixture to be treated.
- 54 Having alternating electrostatic field:**  
This subclass is indented under subclass 15. Apparatus in which a constituent of the fluid mixture is treated or separated by passage of the fluid mixture through or along an alternating electrostatic field established between two electrode members by an alternating current.
- (1) Note. Alternating field ionizers, agglomerators, coalescers, or collectors are classified herein.
- SEE OR SEARCH CLASS:  
95, Gas Separation: Processes, subclass 80 and 81 for electric field separation processes using pulsing or time-varying electric fields (e.g., AC, pulsed DC, etc.).
- 55 And serially arranged nonelectrical separator:**  
This subclass is indented under subclass 15. Apparatus having a separator other than an electric field separation apparatus arranged in the line of fluid flow.
- (1) Note. This and indented subclasses do not provide for (a) baffle means for directing or spreading flow for distribution within the electric field separation apparatus or for contact with ionizing electrodes, or (b) electrodes modified to include baffling or flow distributing arrangements to direct a flowing stream. Such apparatus is more properly classified below.
- (2) Note. This and indented subclasses do not include interstitial, porous, or foraminous collector electrodes that provide means for simultaneously filtering and precipitating contaminants from a flowing stream. Such apparatus is more properly classified below.
- (3) Note. This and indented subclasses will take serially arranged separators even broadly recited coming within the definition.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
60+, for flow distribution means and see (1) Note above.  
65+, for foraminous, porous, or interstitial collectors and see (2) Note above.
- SEE OR SEARCH CLASS:  
55, Gas Separation, subclasses 315+ for nonelectrical separation apparatus with serial diverse separating media.  
95, Gas Separation: Processes, subclasses 63+ for electric field separation processes including a diverse type separator.
- 56 Bypass or modification of flow of gaseous fluid mixture to second stage:**  
This subclass is indented under subclass 55. Apparatus including means for (a) directing at least a portion of the gaseous fluid mixture to pass around the first separator or (b) modifying the quantity or quality of gaseous fluid mixture flowing from the first separator to the second.
- SEE OR SEARCH CLASS:  
55, Gas Separation, subclasses 309+ for nonelectrical separation apparatus with means to bypass separating media.
- 57 Precedent nonelectrical separator:**  
This subclass is indented under subclass 55. Apparatus in which electric field separation apparatus follows downstream of the nonelectrical separator.
- 58 Separator is single porous filter:**  
This subclass is indented under subclass 57. Apparatus in which the nonelectrical separator is a single foraminous, porous, or perforated filter.
- 59 Total flow of gaseous fluid mixture through porous collector electrode:**  
This subclass is indented under subclass 55. Apparatus in which all of the gaseous fluid mixture to be treated flows through openings in a porous collector electrode.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

66+, for electric field separation apparatus with total flow of gaseous fluid mixture through an interstitial or porous collector but without a serially arranged nonelectrical separator.

**60**

**Including gas flow distribution means:**

This subclass is indented under subclass 15. Apparatus having means or arrangements to direct, guide, or limit (including stopping or redirecting) gas flow within the apparatus.

(1) Note. The combination of electric field separation apparatus and a pump for merely causing gas to flow through the apparatus has not been recognized as flow distribution and is not specifically provided for in this section of the class.

(2) Note. This subclass and the subclasses indented hereunder are intended to provide for flow distribution means comprising (a) baffles and deflectors of all types and (b) other structures or fixtures besides flow conduits or the apparatus casing which are intentionally included or positioned to affect flow distribution or which would present a major inherent restriction to gas flow.

**61**

**Spiralling inflow, centrifugal, or whirl generating surface means:**

This subclass is indented under subclass 60. Apparatus having inlet means or means within the apparatus intimately associated with electrical elements to impart a centrifugal, vortical, or cyclonic flow pattern to the gas flow.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

55+, for serially arranged diverse separators, one of which is a vortical separator.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 434+ for nonelectrical separation apparatus with deflectors and see the notes for related search areas.

**62**

**For contact with ionizing electrode or uniform flow in treating zone:**

This subclass is indented under subclass 60. Apparatus in which the means guide or direct gas flow (a) into close proximity to a discharging electrode for more complete ionization or (b) for obtaining a less turbulent or more uniform distribution of flow through the apparatus.

**63**

**Having means for driving gas flow (e.g., fan, blower, etc.):**

This subclass is indented under subclass 62. Apparatus which includes a fan, blower, or other means to push or pull gas through the apparatus.

SEE OR SEARCH CLASS:

55, Gas Separation, subclass 383 for nonelectrical separation apparatus with remote fan or pump for gas flow, subclasses 437+ for nonelectrical separation apparatus with deflector and gas pump or fan, and subclasses 467+ for nonelectrical separation apparatus with other types of gas flow effecting means.

**64**

**Perforated baffle or gas diffuser:**

This subclass is indented under subclass 62. Apparatus which contains at least one baffle penetrated by holes for gas flow or other means to distribute or restrict the flow of gas.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

48, for apparatus with baffling means for gas and liquid applying means for an electrode.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 434+ for nonelectrical separation apparatus with deflector or impingement baffle.  
95, Gas Separation: Processes, subclass 78 for electric field separation processes using baffling, deflection, or restriction of gas flow.

**65**

**Collecting electrode modifies gas flow:**

This subclass is indented under subclass 60. Apparatus in which the distribution means comprises one or more collecting electrodes



shaped (e.g., as with a flow guide or directing means, etc.) or positioned to modify the flow of gas.

- (1) Note. A plurality of collecting electrodes may be arranged in the apparatus to provide a gas flow pattern having special characteristics.

SEE OR SEARCH THIS CLASS, SUBCLASS:

60+, for baffles and perforated ionizing electrodes for directing gas flow around or through ionizing electrodes.

**66 Total flow of gaseous fluid mixture through interstitial or porous collector:**

This subclass is indented under subclass 65. Apparatus in which the collecting electrode or electrodes are arranged and fashioned in such manner as to require all of the gaseous fluid mixture to flow through apertures, pores, or spaces of such electrode(s).

- (1) Note. Arrangements of collector means requiring total flow of gaseous fluid mixture through such means as fibrous massed material, particulate material, and the like are considered to have inherent effect or influence on such flow.
- (2) Note. Spaces must be small enough to have a substantial effect on flow of gaseous fluid mixture.

SEE OR SEARCH THIS CLASS, SUBCLASS:

59, for apparatus with total flow of gaseous fluid mixture through porous collector and serially arranged non-electrical separator.

62+, for apparatus with gas flow distribution means for contact with ionizing electrode.

**67 Zigzag running length:**

This subclass is indented under subclass 66. Apparatus in which the collecting electrode is shaped or positioned to provide a substantially uninterrupted surface of zigzag configuration.

- (1) Note. Uninterrupted surfaces of zigzag configuration are read as having inherent flow controlling influence on the gas-

eous fluid mixture whether so stated in the patent or not.

SEE OR SEARCH CLASS:

55, Gas Separation, subclass 521 for non-electrical separating means of zigzag shape.

**68 Particle type collector:**

This subclass is indented under subclass 66. Apparatus in which the gaseous fluid mixture passes through the apertures, pores, or spaces of a particle type collector.

**69 Layered, laminated, or coated:**

This subclass is indented under subclass 65. Apparatus in which the collecting electrode is composed of plural layers.

- (1) Note. Only collectors with coatings substantial enough to compose complete and distinguishable layers are included in this subclass.

**70 Plural separate electrode members aligned in direction of gas flow:**

This subclass is indented under subclass 65. Apparatus in which a plurality of separate and distinct collecting electrode members are arranged in a serial fashion along the direction of gas flow (e.g., as in Figure 1 below, etc.).

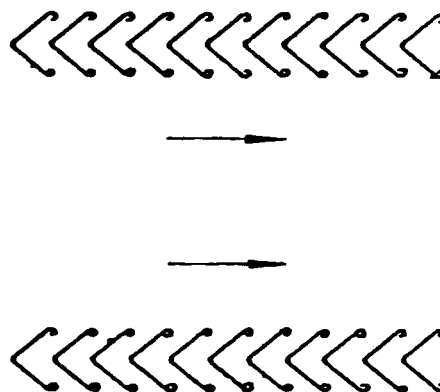


Figure 1

- (1) Note. The separate electrode members may be attached to a common frame or housing, provided that this attachment is made only at the ends of each member. For this purpose, the "ends" of each member are defined as the points most



distant from one another, measured perpendicular to the direction of gas flow.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

71, for segmented collecting electrodes.

71

**Segmented electrode:**

This subclass is indented under subclass 65. Apparatus in which the collecting electrode is composed of plural attached segments, abutted or overlapped, to form a single combined element (e.g., as in Figure 2 below, etc.).

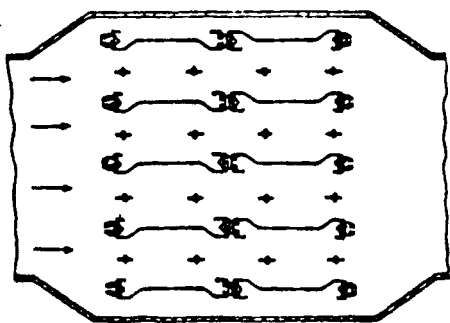


Figure 2

SEE OR SEARCH THIS CLASS, SUB-CLASS:

72, for similar type collecting electrodes with attached projections.

72

**Continuous electrode with integral or attached projections:**

This subclass is indented under subclass 65. Apparatus in which the collecting electrode is composed of a continuous member with raised sections or connected projecting elements extending from its sides or edges (e.g., as in Figure 3 below, etc.).

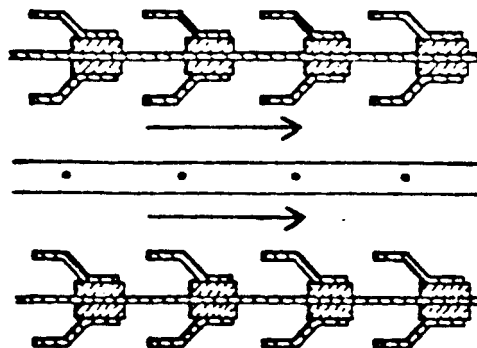


Figure 3

SEE OR SEARCH THIS CLASS, SUB-CLASS:

67, for a zigzag running length collector arranged to allow total flow of gaseous fluid mixture therethrough.

71, for similar type collecting electrodes without integral or attached projections.

73

**Flow distribution means for parallel sections:**

This subclass is indented under subclass 60. Apparatus in which the flow distribution means is effective to restrict or distribute gas flow to or through plural electrode sections arranged to provide parallel flow paths.

74

**With nonelectrical gas treating or conditioning means:**

This subclass is indented under subclass 15. Apparatus which has nonelectrical means to alter a characteristic of the gaseous fluid mixture either before or during electric field separation or to alter a characteristic of the separated gas.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

18+, for electric field treatment or conditioning apparatus with control means responsive to sensed condition.

52+, for electric field separation apparatus with vapor or liquid contacting means.

55+, for electric field separation apparatus with serially arranged nonelectrical separator.



- 61, for electric field separation apparatus with spiralling inflow, centrifugal, or whirl generating surface means.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, sub-classes 58+, 63+, and 73 for electric field separation processes with non-electrical gas treating or conditioning.

**75 Plural diverse electric fields:**

This subclass is indented under subclass 15. Apparatus in which there are provided separate electric fields for separation or treatment of the gaseous fluid mixture (a) by different voltages, currents, or electrode arrangements, or (b) by plural electric field separation units to provide effectively different electric fields arranged in the direction of flow of the gaseous fluid mixture.

- (1) Note. A mere serial or continuous arrangement of electrodes to produce an elongated or repetitive field of one effective character is classified on some other basis.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

- 54, for electric field separation apparatus using an alternating electrostatic field.  
55+, for serially arranged, diverse type separators.  
73, for flow regulating means for electric field separation sections in parallel flow arrangement.  
83+, for electrodes supported or retained by a casing or duct wall and not including features of voltage regulation or special arrangements for electric fields.

**76 One or more electrodes common to plural fields:**

This subclass is indented under subclass 75. Apparatus in which the electric fields are provided by means including arrangements of electrodes such that one electrode or a group or array of similar electrodes is common to the separate electric fields.

**77 Serially arranged ionizing and collecting or agglomerating fields:**

This subclass is indented under subclass 75. Apparatus in which the electrode arrangement defines two electric fields, one downstream of the other in the direction of flow of the gaseous fluid mixture, the upstream field serving primarily to electrically charge particles in the gaseous fluid mixture and the downstream field serving primarily to collect or coalesce the charged particles.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

- 75, for electric field separation apparatus having plural diverse electric fields of other types.  
76, for serially arranged ionizing and collecting or agglomerating fields in which one set of electrodes is common to both fields.

**78 Adjacent parallel collector electrodes are differently charged:**

This subclass is indented under subclass 77. Apparatus in which alternating collecting electrodes are charged to one potential (voltage) and the remaining plates to a second potential.

- (1) Note. For example, if a positive potential is applied to the first alternating set, then either a negative potential or ground would be applied to the remaining electrodes, so that adjacent electrodes would be maintained at differing or opposite voltages.

**79 Collecting electrodes are flat plates:**

This subclass is indented under subclass 78. Apparatus in which the electrodes are in the form of flat plates.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

- 60+, for flat plate collecting electrodes arranged to distribute gas flow.

**80 With details of voltage supply means or circuitry:**

This subclass is indented under subclass 15. Apparatus in which there is more than a nominal recitation of a circuit for voltage supply,



power pack, or some other feature of electric conduction to an electrode.

SEE OR SEARCH THIS CLASS, SUBCLASS:

18+, for voltage supply means involving control means responsive to a sensed condition.

30+, for voltage adjustment means interrelated with cleaning.

SEE OR SEARCH CLASS:

323, Electricity: Power Supply or Regulation Systems, subclasses 220 through 354 for voltage magnitude control means not restricted to electric field separation apparatus as by the inclusion of electrodes.

327, Miscellaneous Active Electrical Non-linear Devices, Circuits, and Systems, appropriate subclasses and particularly subclasses 530+ for miscellaneous circuits having a specific source of supply or bias voltage.

#### 81 Closure interlock or removable section:

This subclass is indented under subclass 80. Apparatus in which means are provided to make or break contact between a power source and an electrode by placement or removal of a movable member or section.

(1) Note. Closure interlocks or switches for deenergizing the electrodes upon gaining access to the apparatus and other nonautomatic electrical blocks are classified in this subclass.

#### 82 Circuit portions:

This subclass is indented under subclass 80. Apparatus which includes specific power source components connected in the form of a circuit.

(1) Note. Merely including a resistor, capacitor, or transformer, for example, is not considered specific enough for this subclass.

SEE OR SEARCH CLASS:

252, Compositions, subclasses 500+ for compositions specialized for conducting electricity.

#### 83 Electrode retaining or supporting means:

This subclass is indented under subclass 15. Apparatus having means to sustain one or more electrodes against gravity in an operative position in the apparatus.

(1) Note. For classification herein, at least some modification of the electrode for retaining it or some mechanical coupling feature as in the case of replaceable units (e.g., a slidably retained assembly, etc.) must be specified.

(2) Note. The electrode means may be (a) retained in a unitary assembly independent of the apparatus casing or (b) supported directly by walls of the apparatus casing.

#### 84 Plural electrode unit assembly type (e.g., unitized, etc.):

This subclass is indented under subclass 83. Apparatus in which plural electrodes are maintained in a spaced relationship and are retained as a unit assembly to thereby permit simultaneous movement into or out of operative position within the apparatus.

#### 85 Disposable (e.g., collapsible or foldable cardboard, etc.):

This subclass is indented under subclass 84. Apparatus in which the unit assembly (e.g., collapsible or foldable cardboard, etc.) is not cleaned for reuse, but is disposed of and replaced by a new unit.

#### 86 Parallel disk or plate collector unit:

This subclass is indented under subclass 84. Apparatus in which individual means for attracting or gathering ionized particles are of flat or planar configuration and have comparatively large surface area, and in which each such means is held parallel to the others.

(1) Note. The structures of this subclass are usually referred to as plate type collectors. Classified here are collectors comprising flat disk or plate members, as contrasted with spherical, tubular, or other such members having surfaces of revolution.



- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 76, and 77+, for a parallel disk or plate collector unit which comprises one field in a serially diverse field arrangement.  
 85, for parallel plate type disposable collector assemblies.  
 87, for parallel disk or plate type collector arrangements not qualifying as unitized assemblies.
- 87 Parallel disk or plate collector:**  
 This subclass is indented under subclass 83. Apparatus in which individual means for attracting or gathering ionized particles are of flat or planar configuration and have comparatively large surface area, and in which each such means is held parallel to the others.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 86, for parallel disk or plate collectors retained as a unitary assembly.
- 88 With insulation feature:**  
 This subclass is indented under subclass 83. Apparatus in which the electrode retaining or supporting arrangement has electrical nonconductor means.
- (1) Note. A mere housing or the like to keep parts dry is not considered a nonconductor means for this class.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 15, for nonconducting features other than a mere conductor sheath to maintain an electrically insulated condition.
- SEE OR SEARCH CLASS:  
 174, Electricity: Conductors and Insulators, particularly subclasses 137+ for insulators, per se, and for electrical apparatus with insulating means not limited to or solely disclosed for use in gas separators (e.g., electric field separation apparatus, etc.).
- 89 Tensioning means:**  
 This subclass is indented under subclass 83. Apparatus in which means are provided for maintaining an electrode under tension, with the tension being due to more than the weight of the electrode.
- 90 Spring or expansible bellows:**  
 This subclass is indented under subclass 89. Apparatus in which the tension is maintained by the use of spring means or bellows which may be expanded by stretching, with the spring means or bellows connected to the electrode in such a way as to maintain tension therein.
- 91 Hanging weight:**  
 This subclass is indented under subclass 89. Apparatus in which the tension is provided by a hanging weight.
- 92 Suspensory means:**  
 This subclass is indented under subclass 83. Apparatus in which the sustaining means is such as to afford support by making contact above the bottommost surface or face of the electrode in its normal operating position (e.g., electrode is held at the top, middle, etc.).
- 93 Nonrigid support (e.g., hanging electrode, etc.):**  
 This subclass is indented under subclass 92. Apparatus in which the electrode is supported in such a way as to allow swinging movement about the point of support.
- (1) Note. The provision of nonrigid damping means to reduce electrode movement during use does not exclude placement in this subclass.
- 94 Movably supported during use or for orientation:**  
 This subclass is indented under subclass 83. Apparatus in which electrode means is sustained against gravity in such a manner as to afford movement thereof (a) while it is operative as an electrode or (b) for adjustment or orientation without disassembly.
- SEE OR SEARCH THIS CLASS, SUB-CLASS:  
 39+, for movably mounted electrode assemblies so mounted for cleaning.



## SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass 77 for electric field separation processes involving a continuously moving electrode.

**95 Ionizing electrode details (e.g., coil, mat, corona suppression, etc.):**

This subclass is indented under subclass 15. Apparatus in which an ionizing electrode stock material or composite has been specially altered, configured, or constructed (e.g., coil, mat, corona suppression, etc.).

- (1) Note. Although the vast majority of patents in this section of the class must include discharge electrodes, not all patents will be referred to this group. Ionizers claimed by name only and having no unusual property will be omitted from this group.
- (2) Note. Electrodes having means (a) tending to limit the building up of a concentrated charge or (b) preventing the formation of a shortened discharge path, to thereby preclude sparkover are included.

## SEE OR SEARCH CLASS:

252, Compositions, subclasses 500+ for compositions specialized for conducting electricity and electrodes defined solely by their composition. For electrodes not classified in Class 252, see the search notes under Class 252, subclass 500.

361, Electricity: Electrical Systems and Devices, subclasses 230+ for means injecting ions into the atmosphere.

427, Coating Processes, subclasses 58+ for processes of coating, per se, wherein the product is electrical.

**96 Filamentary or filar form:**

This subclass is indented under subclass 95. Apparatus in which the electrode material is comprised of fine wire.

- (1) Note. A fine-tipped wire supported such that electron flow is concentrated off the tip, fine coils of random or specific pitch, spun wool, and the like are typical

examples of filamentary or filar form ionizers.

**97 Sharpened point, serrated, or tip discharge:**

This subclass is indented under subclass 95. Apparatus in which the ionizing electrode is provided with a projecting point or finely dimensioned projection, as compared with the remainder or body of the ionizing electrode, or a tip to provide for concentrated discharge of electrons.

**98 Collecting electrode details (e.g., sheet type, running length web, etc.):**

This subclass is indented under subclass 15. Apparatus in which a collecting electrode stock material or composite has been specifically altered, configured, or constructed (e.g., sheet type, running length web, etc.).

## SEE OR SEARCH THIS CLASS, SUBCLASS:

66+, for collectors of interstitial, perforated, foraminous, or porous construction through which the gaseous fluid mixture to be separated is constrained to flow.

## SEE OR SEARCH CLASS:

252, Compositions, subclasses 500+ for electrodes defined solely in terms of composition and see the search notes under Class 252, subclass 500 for electrodes not there classified.

427, Coating Processes, subclasses 58+ for processes of coating, per se, wherein the product is electrical.

**99 Dielectric material containing or covering:**

This subclass is indented under subclass 98. Apparatus in which the collecting electrode is a composite element containing or being coated with a nonconducting (insulating) material or with substances having relatively high resistance to the flow of electricity.

**100 Multiple similar elements or sections (e.g., built up, etc.):**

This subclass is indented under subclass 98. Apparatus in which the collecting electrode is comprised of multiple units or items all of the same kind placed or secured together to thereby define a composite member (e.g., built up, etc.).



**101 CHROMATOGRAPHY TYPE APPARATUS:**

This subclass is indented under the class definition. Apparatus comprising a column containing (a) a liquid, known as the “stationary liquid phase,” supported by a base of solid material to successively sorb therein the different gases in a plurality of gases or (b) a solid sorbent to successively sorb thereon the different gases in a plurality of gases with or without subsequently successively eluting or displacing the sorbed gases with a gas which is inert with respect to the sorbed gases and sorbent.

- (1) Note. The plurality of gases is usually allowed to flow slowly through a column of sorbent. Different gases will pass at different speeds through the column and will eventually be separated into zones. The zones can be eluted by passing an inert gas through the column and collecting the various fractions.
- (2) Note. Use of a liquid supported by a base of solid material for the separation of mixture of gases is known as “gas-liquid chromatography” or “GLC.” Use of a solid sorbent without a liquid phase present is known as “gas-solid chromatography.” Other terms used when referring to chromatography type apparatus include: “gas chromatography” or “GC,” “vapor-phase chromatography” or “VPC,” “gas-liquid partition chromatography,” “vapor fractometry,” “capillary column gas chromatography” or “CC-GC,” and “partition chromatography.”
- (3) Note. Sometimes a “carrier” gas is mixed with or used to propel a plurality of gases to be separated through the chromatography apparatus.
- (4) Note. The plurality of gases to be separated may be obtained by vaporizing a liquid. The liquid that is injected into the chromatography column is vaporized, and then the resulting vapors are separated in the chromatography column.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 108+, for solid sorbent apparatus of a more general nature used to sorb gases or liquids from a gas phase.

**SEE OR SEARCH CLASS:**

- 73, Measuring and Testing, subclass 19.02, 23.22+, and 23.35+ for chromatography processes including analysis of eluted or displaced gas.
- 95, Gas Separation: Processes, subclasses 82+ for chromatography processes.
- 210, Liquid Purification or Separation, subclasses 198.2+ for apparatus and subclasses 635 and 656+ for processes for the purification or separation of liquids using chromatography.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclass 89 for gas chromatography apparatus involving chemical reaction and associated with an analyzer, structured indicator, or manipulative laboratory device.

**102 With control means responsive to sensed condition:**

This subclass is indented under subclass 101. Apparatus in which means are provided to detect an apparatus or process characteristic or a change therein and to control or regulate operation of the apparatus or process based upon the detected characteristic or change therein.

- (1) Note. In this subclass a single means may be used both to detect the characteristic or a change therein and to implement an action in the apparatus based upon the detected characteristic or change therein. There must be a positive action made by the means because of the detected characteristic or change therein. An example is a pressure relief valve in which a certain pressure must be reached before the valve opens to relieve pressure differential across the valve. Another example is a thermostat with a bimetallic element in which a certain temperature must be reached before the element is deformed enough to trip a



switch, thus implementing a control action in the apparatus as a result of the temperature or change therein. Apparatus in which no positive action is made by the single means as a result of the detected characteristic or change therein is not classified in this subclass, but is classified below.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 18+, for electric field separation apparatus with similar control means.
- 103, for chromatography type apparatus with programmed, cyclic, or time responsive control means.
- 109+, for solid sorbent apparatus with similar control means.
- 156+, for degasifying means for liquid with similar control means.
- 397+, for gas separation apparatus with automatic control means for gas or nongaseous constituent discharge.
- 417+, for gas separation apparatus with signals, indicators, measuring, or testing means.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclasses 1+ for gas separation processes with control responsive to sensed condition, subclass 25 for processes with recording or signaling condition, and subclass 26 for processes with timing of operation.

**103 With programmed, cyclic, or time responsive control means:**

This subclass is indented under subclass 101. Apparatus which is provided with control means not directly responsive to a sensed condition for (a) storing coded instructions or other data necessary to regulate operation of the apparatus, (b) repetitively regulating a sequence of operational steps performed in or by the apparatus, or (c) causing various operations to occur according to preset timing sequences or to last for predetermined durations (e.g., timer switches, etc.).

- (1) Note. This subclass is meant broadly and includes any control means which predetermines apparatus operation or regulates repetition.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 25, for electric field separation apparatus with similar control means.
- 115+, for solid sorbent apparatus with similar control means.
- 424, for gas separation apparatus with timing or changeable programming means.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclass 26 for processes with timing of operation.

**104 Plural separate and distinct stages:**

This subclass is indented under subclass 101. Apparatus which has two or more separate and distinct stages or zones for chromatographic treatment of the plurality of gases where these stages may either be contained within the same column or housed in separate columns.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 55+, for apparatus with serially arranged electric field and nonelectrical separators.
- 121+, for apparatus with plural solid sorbent beds.
- 134+, for solid sorbent apparatus with plural basically diverse separating means.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclass 86 for chromatographic processes using plural separate columns.

**105 Including injection system or inlet fluid distributor:**

This subclass is indented under subclass 101. Apparatus which includes means specifically structured and disposed at the chromatography column inlet to inject or distribute the plurality of gases or a liquid for treatment therein.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclass 89 for the process of injecting a plurality of gases or a liquid into a chromatography type apparatus without causing separation thereof.



141, Fluent Material Handling, With Receiver or Receiver Coating Means, for processes and apparatus for the transfer of fluent material through a flow confining system, the source and receiver parts of which are normally separable.

**106 Having system connector or coupling:**

This subclass is indented under subclass 101. Apparatus which is provided with a flow connector or coupling in tubing between different sections of a chromatography system.

- (1) Note. This subclass is intended to include only those systems with couplings to connect nonchromatography type stages with chromatography or non-chromatography type stages.

SEE OR SEARCH THIS CLASS, SUBCLASS:

104, for apparatus having plural separate chromatographic stages.

SEE OR SEARCH CLASS:

285, Pipe Joints or Couplings, for connectors or tubing couplings, per se.

**107 Having imbedded baffle or flow distributor:**

This subclass is indented under subclass 101. Apparatus which has been constructed with (a) a static solid surface member (e.g., deflector, etc.) or (b) other static layer of solid material (e.g., nonsorbent particles, etc.) inside the column in order to redirect or channel gas flow.

SEE OR SEARCH THIS CLASS, SUBCLASS:

152, for solid sorbent apparatus with a baffle for directing gas flow, which may be imbedded in the solid sorbent bed.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 434+ for deflectors of diverse type used to redirect the flow of gas at some point in the treatment apparatus.

95, Gas Separation: Processes, subclass 85 for corresponding processes. Patents are not cross-referenced from Class 95, subclass 85 to this subclass based only on disclosure. Therefore, relevant disclosures of gas separation

apparatus may be found in the process area.

**108 SOLID SORBENT APPARATUS:**

This subclass is indented under the class definition. Apparatus in which a solid sorbent (e.g., particulate or fibrous mass of solids, etc.) is used to retain on its internal or external surfaces a constituent of the fluid mixture passing in contact therewith.

- (1) Note. A solid sorbent is a solid material which separates one or more constituents (e.g., gas, vapor, etc.) from a fluid mixture containing such constituents in a "quasi-chemical" manner. The action in most instances is that of selective retention (i.e., the sorbent removes only that part of the fluid mixture for which it has the greatest affinity). The retained constituent cannot be removed by shaking, brushing, or similar mechanical action, but can generally be removed by heating, pressure reduction, or use of a stripping or denuding fluid.

A filter (e.g., particulate solids, etc.) has no particular "chemical" affinity for a constituent of a fluid mixture. The separation in the case of a filter depends on a mechanical entrapment of solid particles because of their relatively large size compared with the interstices or spaces between individual elements of the filter. The retained particles can be removed by brushing, wiping, shaking, or similar mechanical action.

- (2) Note. "Absorption" is the holding of a constituent by cohesion or capillary action in the pores of a solid. "Adsorption" is the ability of a sorbent to hold or concentrate gases, liquids, or dissolved substances upon its surface.
- (3) Note. "Gettering" or use of a "getter" material may involve one or more different processes to remove an undesired constituent from a gaseous mixture, usually within an enclosed space, by sorption, chemical reaction, etc. Class 96 provides for getter apparatus under the class definition except where such apparatus is part of a more comprehensive



apparatus properly classified elsewhere. This subclass provides for getter apparatus of the solid sorbent type only. See the search class notes below and the class definition for class lines between Class 96 and other applicable classes.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

101+, for chromatography type apparatus which contains or utilizes a solid sorbent.

**SEE OR SEARCH CLASS:**

62, Refrigeration, for processes and apparatus with solid desiccant disposed in a refrigeration system.

95, Gas Separation: Processes, subclasses 82+ and 90+ for corresponding chromatography and solid sorption processes, respectively.

123, Internal-Combustion Engines, subclasses 519+ for an internal-combustion engine including a charge-forming device having a fuel vapor recovery and storage system wherein the fuel vapor storage system is an adsorbent canister.

206, Special Receptacle or Package, subclass .7 for receptacles and packages for storing gas containing an adsorbent in which the gas is stored and subclass 204 for receptacles and packages including means for removing water or water vapor from the atmosphere within a container or the surface of container content.

210, Liquid Purification or Separation, subclasses 660+ for ion exchange or selective sorption processes; subclasses 150+ for apparatus for liquid purification or separation consisting of solid contact means to increase the surface area of a liquid in a gas-liquid contact device whereby the contact is enhanced; and subclasses 263+ for liquid purification or separation apparatus of the particulate material type (e.g., ion exchange or sand bed, etc.).

252, Compositions, subclasses 181.1+ for gas getter compositions for electric lamps, electric space discharge devices, and similar devices and subclass 184 for absorptive or bindive

and chemically yieldive compositions under the class definition.

313, Electric Lamp and Discharge Devices, subclass 481 for cathode ray tube envelopes with getter or gas and subclasses 547+ and 553+ for electric lamp or discharge devices with getter means.

417, Pumps, subclasses 48+ for electrical or getter type pump apparatus.

420, Alloys or Metallic Compositions, for metal alloys or compositions used for gas (e.g., hydrogen, etc.) storage.

422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 129+ for chemical reactors, particularly subclasses 177+ for particulate catalyst beds and other solid, extended surface fluid contact reaction means.

423, Chemistry of Inorganic Compounds, for processes of chemical storage and release (e.g., subclass 658.2 for direct decomposition of a binary compound containing hydrogen, etc.).

445, Electric Lamp or Space Discharge Component or Device Manufacturing, subclasses 53+ for manufacturing processes including evacuating, degasifying, or getter or fluent material introduction, particularly subclass 55 for gettering.

502, Catalyst, Solid Sorbent, or Support Therefor: Product or Process of Making, for solid sorbent, per se; and subclasses 20+ for the regeneration of sorbents. See section III of this class for the line between these two classes.

**109 With control means responsive to sensed condition:**

This subclass is indented under subclass 108. Apparatus in which means are provided to detect an apparatus or process characteristic or a change therein and to control or regulate operation of the apparatus or process based upon the detected characteristic or change therein.

(1) Note. In this subclass and the subclasses indented hereunder, a single means may be used both to detect the characteristic or a change therein and to implement an action in the apparatus or process based



upon the detected characteristic or change therein. There must be a positive action made by the means because of the detected characteristic or change therein. An example is a pressure relief valve in which a certain pressure must be reached before the valve opens to relieve pressure differential across the valve. Another example is a thermostat with a bimetallic element in which a certain temperature must be reached before the element is deformed enough to trip a switch, thus implementing a control action in the apparatus as a result of the temperature or change therein. A third example is a separating medium which experiences a change in mass due to accumulation of a separated constituent, causing the separating medium to move to a position of nonuse or regeneration. Apparatus in which no positive action is made by the single means as a result of the detected characteristic or change therein is not classified in this subclass or the subclasses indented hereunder, but is classified below.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 18+, for electrical precipitators with similar control means.
- 102, for chromatography type apparatus with similar control means.
- 115+, for solid sorbent apparatus with programmed, cyclic, or time responsive control means.
- 156+, for liquid degasifying means with similar control means.
- 397+, for other gas separation apparatus with automatic control means for gas or nongaseous constituent discharge.
- 417+, for other gas separation apparatus with signals, indicators, measuring, or testing means.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclasses 1+ for gas separation processes with control responsive to sensed condition, subclass 25 for processes with recording or signaling condition, and subclass 26 for processes with timing of operation.

**110 Fluid flow sensing means:**

This subclass is indented under subclass 109. Apparatus which is provided with means to detect fluid flow or a change therein and to control operation of the apparatus based upon the detected fluid flow or change therein.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclass 23 for processes with control responsive to gas flow rate.

**111 Concentration sensing means:**

This subclass is indented under subclass 109. Apparatus which is provided with means to detect concentration of a constituent present in a fluid stream (e.g., humidity, etc.) or a change therein and to control operation of the apparatus based upon the detected concentration or change therein.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 19, for electrical separation apparatus with control means responsive to concentration or temperature.
- 407, for other gas separation apparatus having temperature or humidity responsive control means for gaseous or nongaseous constituent discharge.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclasses 8+ for gas separation processes with control responsive to concentration.
- 236, Automatic Temperature and Humidity Regulation, for control apparatus of this type, per se.

**112 Temperature sensing means:**

This subclass is indented under subclass 109. Apparatus which is provided with means to detect temperature or a change therein and to control operation of the apparatus based upon the detected temperature or change therein.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 19, for electrical separation apparatus with control means responsive to concentration or temperature.



- 173, for degasifying means for liquid with control means responsive to temperature.
- 407, for other gas separation apparatus having temperature or humidity responsive control means for gaseous or nongaseous constituent discharge.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclasses 14+ for gas separation processes with control responsive to temperature.
- 236, Automatic Temperature and Humidity Regulation, for control apparatus of this type, per se.

**113 Pressure sensing means:**

This subclass is indented under subclass 109. Apparatus which is provided with means to detect pressure or a change therein and to control operation of the apparatus based upon the detected pressure or change therein.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 174, for degasifying means for liquid with control means responsive to pressure.
- 400+, for other gas separation apparatus having gas pressure responsive automatic control means for gaseous or nongaseous constituent discharge.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclass 15 for processes with control responsive to sensed temperature and pressure and subclasses 19+ for processes with control responsive to sensed pressure.

**114 And programmed, cyclic, or time responsive control means:**

This subclass is indented under subclass 113. Apparatus which is also provided with control means not directly responsive to a sensed condition for (a) storing coded instructions or other data necessary to regulate operation of the apparatus, (b) repetitively regulating a sequence of operational steps performed in or by the apparatus, or (c) causing various operations to occur according to preset timing sequences or to last for predetermined durations (e.g., timer switches, etc.).

- (1) Note. This subclass includes any control means which maintains an operating condition, predetermines apparatus operation, or regulates repetition.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 25, for electrical separation apparatus with programmed, cyclic, or time responsive control means not responsive to a sensed condition.
- 103, for chromatography type separation apparatus with programmed, cyclic, or time responsive control means not responsive to a sensed condition.
- 115+, for solid sorbent apparatus with programmed, cyclic, or time responsive control means not responsive to a sensed condition.
- 424+, for other gas separation apparatus having timing or changeable programming means.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclass 26 for gas treating processes with timing of operation.

**115 With programmed, cyclic, or time responsive control means:**

This subclass is indented under subclass 108. Apparatus which is provided with control means not directly responsive to a sensed condition for (a) storing coded instructions or other data necessary to regulate operation of the apparatus, (b) repetitively regulating a sequence of operational steps performed in or by the apparatus, or (c) causing various operations to occur according to preset timing sequences or to last for predetermined durations (e.g., timer switches, etc.).

- (1) Note. This subclass includes any control means which maintains an operating condition, predetermines apparatus operation, or regulates repetition.
- (2) Note. Apparatus not specifically designed or used as described above (e.g., with mere use of a rotating gas distributor, etc.) are more appropriately classified below.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 25, for electrical separation apparatus with programmed, cyclic, or time responsive control means.
- 103, for chromatography type separation apparatus with programmed, cyclic, or time responsive control means.
- 114, for solid sorbent apparatus with programmed, cyclic, or time responsive control means combined with control means responsive to sensed pressure.
- 124, for solid sorbent apparatus with plural solid sorbent beds and rotating gas distributor means not combined with control means.
- 424+, for other gas separation apparatus having timing or changeable programming means.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 26 for gas treating processes with timing of operation.

#### 116 **Regulating or metering means:**

This subclass is indented under subclass 115. Apparatus which is also provided with means to maintain or adjust an apparatus or process characteristic using regulator or meter type components (e.g., programmed pressure regulator, metering valve, flow restrictor, etc.).

#### 117 **Indicating, signal, or alarm means:**

This subclass is indented under subclass 115. Apparatus which is also provided with means to indicate or signal an apparatus or process characteristic or change therein (e.g., to indicate the extent of solid sorbent saturation, etc.), or with means to alert the condition of such a characteristic.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 417, for other gas separation apparatus with signals, indicators, measuring, or testing means.

SEE OR SEARCH CLASS:

- 73, Measuring and Testing, for measuring and testing processes and apparatus.

- 95, Gas Separation: Processes, subclass 25 for gas treating processes with recording or signaling condition.
- 116, Signals and Indicators, particularly subclasses 67+ for alarms and subclasses 200+ for indicators.
- 374, Thermal Measuring and Testing, for thermal measuring methods and devices, particularly subclasses 100+ for thermometers and other devices.

#### 117.5 **With indicating means (e.g., color change indicator, etc.):**

This subclass is indented under subclass 108. Apparatus having information giving means of an audible or visual nature that give information about an apparatus or process characteristic or change therein.

- (1) Note. Included in this definition are solid sorbents containing a substance that changes color in order to provide a visual indication of the saturation level of the solid sorbent.

#### 118 **Soluble or deliquescent type (e.g., calcium chloride, etc.):**

This subclass is indented under subclass 108. Apparatus in which the solid sorbent dissolves in the constituent retained or sorbed therein or thereon.

- (1) Note. Soluble sorbents of this type are usually composed of a metallic salt or brine material used to retain liquids or condensable gases from a gaseous fluid mixture.
- (2) Note. These soluble type sorbents are also called "hygroscopic" materials since they are frequently used to remove moisture from a contacting gaseous fluid mixture.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 91 for corresponding processes using soluble or deliquescent material. Patents are not cross-referenced from Class 95, subclass 91 to this subclass based only on disclosure. Therefore, relevant disclosures of gas separation apparatus may be found in the process area.



- 119 Supported by holder with drip openings:**  
This subclass is indented under subclass 118. Apparatus which comprises a support or holder with one or more drip openings to allow drainage of the dissolved solid sorbent.
- 120 Including liquid contacting means:**  
This subclass is indented under subclass 119. Apparatus which is provided with means to allow the entering fluid mixture to contact the dissolved solid sorbent as it drains through the holder drip openings.
- 121 Plural solid sorbent beds:**  
This subclass is indented under subclass 108. Apparatus which comprises two or more masses of solid sorbent which may be either combined within a single housing or distributed into separate units.
- (1) Note. Plural layers of solid sorbent and support material (e.g., laminated, corrugated, etc.) do not constitute plural beds unless clearly separable one from another for staged use (e.g., separate and distinct packing units, divided section, etc.).
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
104, for chromatography apparatus with plural separate stages.  
134, for solid sorbent apparatus with plural basically diverse separating means.  
154, for solid sorbent which has been layered or laminated on a second solid sorbent or nonsorbent support.
- 122 With recovery or separation means for desorbing fluid:**  
This subclass is indented under subclass 121. Apparatus which includes a recovery or separation means for a fluid used to regenerate the solid sorbent.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
130, for plural solid sorbent beds with means to regenerate sorbent but without recovery means for desorbing fluid.  
143+, for solid sorbent apparatus with sorbent regenerating means but without plural beds or recovery means for desorbing fluid.
- 123 Movable solid sorbent bed (e.g., fluidized bed, etc.):**  
This subclass is indented under subclass 122. Apparatus in which (a) at least one of the solid sorbent beds is arranged for movement, either by physically moving a housing containing the solid sorbent or by causing the solid sorbent alone to move from one place to another, or (b) the solid sorbent is caused to be moved about or fluidized by a gas.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
125, for plural solid sorbent beds in which at least one of the beds is caused to rotate.  
150, for a movable or fluidized solid sorbent bed, but without plural beds or recovery means for desorbing fluid.
- SEE OR SEARCH CLASS:  
34, Drying and Gas or Vapor Contact With Solids, subclasses 359+ for processes and subclasses 576+ for apparatus utilizing fluid current for conveying or suspending of dried solids.  
55, Gas Separation, subclass 474 for general gas separating apparatus with particulate solids movement during use or agitating means therefor.  
95, Gas Separation: Processes, subclasses 107+ for processes using moving solid sorbent.  
406, Conveyors: Fluid Current, for pneumatic solids conveyors, particularly subclasses 86+ and 136+ for means to fluidize the conveyed solids.  
422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 139+ for fluidized bed chemical reactors.



**124 With rotating gas distributor:**

This subclass is indented under subclass 121. Apparatus in which a rotating means is positioned to distribute the fluid mixture to be treated over one or more of the solid sorbent beds.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

125, for plural solid sorbent beds in which at least one solid sorbent bed is rotating.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass 113 for processes utilizing a rotating housing containing fixed solid sorbent.

**125 Rotating solid sorbent bed:**

This subclass is indented under subclass 121. Apparatus in which one or more of the solid sorbent beds is rotated about one or more axes.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

124, for plural nonrotating solid sorbent beds provided with a rotating gas distributor.  
150, for single movable solid sorbent bed apparatus.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass 113 for processes utilizing a rotating housing containing fixed solid sorbent.

**126 With heat exchange means:**

This subclass is indented under subclass 121. Apparatus which is provided with means to heat or to cool the solid sorbent, the fluid mixture, a separated constituent, or a gas stream.

(1) Note. This subclass includes apparatus utilizing heat exchange to regenerate or recondition solid sorbent for use after such regeneration.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

146, for single solid sorbent bed apparatus with means for regenerating the sorbent by heat exchange.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclasses 114+ for solid sorption processes with plural indirect heat transfer steps.

**127 And means for driving gas flow (e.g., pump, blower, compressor, etc.):**

This subclass is indented under subclass 126. Apparatus which is also provided with means for driving or effecting gas flow (e.g., pump, blower, compressor, etc.).

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 467+ for general gas separation apparatus with gas flow effecting means.  
417, Pumps, for pumps used to drive fluid flow.

**128 Compressor:**

This subclass is indented under subclass 127. Apparatus in which the means for driving gas flow is a device used to pressurize gas (e.g., reciprocating piston type, bellows, rotary type, etc.).

SEE OR SEARCH CLASS:

417, Pumps, appropriate subclasses, for pumps and compressors, per se.

**129 Zigzag arrangement of flat solid sorbent beds for parallel flow:**

This subclass is indented under subclass 121. Apparatus in which flat rectangular solid sorbent beds are arranged and secured in a holder device in a zigzag fashion such that gas flow is directed through only one layer of sorbent before leaving the apparatus.

**130 With means for regenerating solid sorbent:**

This subclass is indented under subclass 121. Apparatus which is provided with means to remove a sorbed constituent from the solid sorbent, thus regenerating the solid sorbent for further use.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 122, for plural solid sorbent beds with recovery means for desorbing fluid.
- 143+, for solid sorbent apparatus with regenerating means but without plural sorbent beds.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclasses 90+ for solid sorption processes which may include regeneration of the solid sorbent.

### 131 **Serial:**

This subclass is indented under subclass 121. Apparatus in which the plural solid sorbent beds are arranged for sequential gas flow.

### 132 **Diverse type:**

This subclass is indented under subclass 131. Apparatus in which the serial solid sorbent beds are of different types (e.g., material composition, particulate vs. sheet form, etc.).

- (1) Note. Solid sorbent beds which are merely different in particle size or sheet thickness are not of "diverse type" and as such are not classified in this subclass.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 134+, for plural diverse gas separating means with no more than one solid sorbent bed.

### 133 **Plural canisters:**

This subclass is indented under subclass 121. Apparatus in which two or more containers are used to hold the solid sorbent beds.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 136, for plural diverse separating means in separate housings or casings.

### 134 **Plural diverse separating means:**

This subclass is indented under subclass 108. Apparatus which comprises two or more different types of gas separating means, at least one of which must be a solid sorbent (e.g., solid sorbent and mechanical filtering means, etc.).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 132, for plural serial diverse type solid sorbent beds.

SEE OR SEARCH CLASS:

- 55, Gas Separation, subclasses 315+ for plural serial basically diverse gas separating media without the use of a solid sorbent.

### 135 **At least one a dispersed or impregnated solid sorbent bed:**

This subclass is indented under subclass 134. Apparatus which includes at least one bed of solid sorbent (a) dispersed in a second sorbing or nonsorbing medium (e.g., sorbent particles bonded in a matrix or set in a mass of filler material, etc.) or (b) impregnated with a second nonsorbing material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 153, for dispersed or impregnated solid sorbent beds; not combined with any other type of gas separating means.

### 136 **Plural housings or casings for separating components:**

This subclass is indented under subclass 134. Apparatus which is provided with plural, usually separate, containers for different separating components or means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 104, for chromatography type apparatus with plural separate stages.
- 133, for solid sorbent apparatus with plural solid sorbent beds in separate canisters.

### 137 **With means to compress or compact solid sorbent bed:**

This subclass is indented under subclass 134. Apparatus in which a spring or other compacting means is provided to exert continual physical force on a solid sorbent bed to maintain close packing of individual solid particles.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

149, for solid sorbent apparatus with means to compress or compact a solid sorbent bed; not combined with any other type of gas separating means.

**138 Including means to access or replace solid sorbent:**

This subclass is indented under subclass 134. Apparatus which is provided with a removable solid sorbent cartridge, opening to access solid sorbent, or other means to allow replacement of spent or used solid sorbent with new or regenerated solid sorbent.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

151, for solid sorbent apparatus with means to access or replace solid sorbent; not combined with any other type of gas separating means.

**139 Including baffle for modifying gas flow (e.g., flow vanes, diffuser, etc.):**

This subclass is indented under subclass 134. Apparatus in which a static solid surface member (e.g., deflector, etc.) is provided to modify or distribute a gas flowing in contact therewith (e.g., flow vanes, gas diffuser, etc.).

SEE OR SEARCH THIS CLASS, SUB-CLASS:

107, for chromatography type apparatus with imbedded baffle or flow distributor.

152, for solid sorbent apparatus with a baffle for directing gas flow.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 434+ for general gas separation apparatus with deflector means.

**140 And means for driving gas flow:**

This subclass is indented under subclass 139. Apparatus which is also provided with means for driving or effecting gas flow.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

127+, for plural solid sorbent beds with heat exchange means and means for driving gas flow, such as a pump, blower, or compressor.

142, for solid sorbent apparatus with plural diverse separating means and with means for driving gas flow, not including a baffle for modifying gas flow.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 467+ for general gas separation apparatus with gas flow effecting means.

**141 And means regenerating solid sorbent:**

This subclass is indented under subclass 139. Apparatus which is also provided with means to desorb a retained constituent from the solid sorbent.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

122+, for plural solid sorbent beds with recovery or separation means for desorbing fluid.

130, for plural solid sorbent beds with means for regenerating solid sorbent.

143+, for solid sorbent apparatus with means for regenerating solid sorbent, without plural diverse separating means.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclasses 90+ for solid sorption processes which may include regeneration of the solid sorbent.

**142 With means for driving gas flow:**

This subclass is indented under subclass 134. Apparatus which is provided with means for driving or effecting gas flow.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

127+, for plural solid sorbent beds with heat exchange means and means for driving gas flow, such as a pump, blower, or compressor.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 467+ for general gas separation apparatus with gaseous fluid flow effecting means.



**143 With means regenerating solid sorbent:**

This subclass is indented under subclass 108. Apparatus which is provided with means to desorb the retained constituent from the solid sorbent.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

122+, for plural solid sorbent beds with recovery means for desorbing fluid.  
130, for plural solid sorbent beds with means for regenerating solid sorbent.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclasses 90+ for solid sorption processes which may include regeneration of the solid sorbent.

**144 Gas contacting means:**

This subclass is indented under subclass 143. Apparatus in which the solid sorbent is regenerated by a means contacting gas therewith.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclasses 97+, 104+, and 122+ for processes of gas separation using solid sorption with sweep gas used to help remove a sorbed constituent.

**145 Means applies steam to solid sorbent:**

This subclass is indented under subclass 144. Apparatus in which the contacting means is provided to apply steam to the solid sorbent to effect regeneration thereof.

**146 Heat exchanger to regenerate:**

This subclass is indented under subclass 143. Apparatus in which the solid sorbent is regenerated by heating or cooling means.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

126+, for plural solid sorbent beds with heat exchange means.

SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass 87 for chromatography processes with heating or cooling and subclasses 114+ for solid sorption processes with plural indirect heat transfer steps.

**147 Having mountable casing:**

This subclass is indented under subclass 108. Apparatus which is provided with means to support or attach a container for the solid sorbent.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 490+ for apparatus with fixed media securing or retaining means.

**148 Storage or food receptacle:**

This subclass is indented under subclass 147. Apparatus which is attached to or utilized in connection with a storage or food container.

SEE OR SEARCH CLASS:

99, Foods and Beverages: Apparatus, subclass 347 for self-basting cooking utensils (e.g., wherein condensed vapors are returned to the utensil, etc.).  
220, Receptacles, subclass 366.1 and 367.1+ for vented closures, particularly subclasses 369+ for antispattering covers.

**149 With means to compress or compact solid sorbent bed:**

This subclass is indented under subclass 108. Apparatus in which a spring or other compacting means is provided to exert a continual physical force on a solid sorbent bed to maintain close packing of individual solid sorbent particles.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

137, for solid sorbent apparatus with plural diverse separating means also having means to compress or compact a solid sorbent bed.

**150 Movable solid sorbent bed (e.g., fluidized bed, etc.):**

This subclass is indented under subclass 108. Apparatus in which (a) the solid sorbent is arranged for movement, either by physically moving the housing containing the solid sorbent or by causing the solid sorbent alone to move from one place to another or (b) the solid sorbent is moved about or fluidized by a gas.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 123, for movable plural solid sorbent beds with recovery means for desorbing fluid.
- 125, for plural solid sorbent beds in which at least one of the beds is rotated.

SEE OR SEARCH CLASS:

- 34, Drying and Gas or Vapor Contact With Solids, subclasses 359+ for processes and subclasses 576+ for apparatus utilizing fluid current conveying or suspending of dried solids.
- 55, Gas Separation, subclass 474 for general gas separating apparatus with particulate solids movement during use of agitating means therefor.
- 95, Gas Separation: Processes, subclasses 107+ for processes using a moving solid sorbent.
- 406, Conveyors: Fluid Current, for pneumatic solids conveyors, particularly subclasses 86+ and 136+ for means to fluidize the conveyed material.
- 422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 139+ for fluidized bed chemical reactors.

**151 Including means to access or replace solid sorbent:**

This subclass is indented under subclass 108. Apparatus which is provided with a removable solid sorbent cartridge, opening to access solid sorbent, or other means to allow replacement of spent or used solid sorbent with new or regenerated solid sorbent.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 138, for solid sorbent apparatus combined with diverse separating means and means to access or replace solid sorbent.

**152 Including baffle for modifying gas flow (e.g., imbedded in solid sorbent, etc.):**

This subclass is indented under subclass 108. Apparatus in which a static solid surface member (e.g., deflector, etc.) is provided to modify or distribute gas flowing in contact therewith,

such as might be imbedded in a solid sorbent bed.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 107, for chromatography type apparatus with imbedded baffle or flow distributor.
- 139, for solid sorbent apparatus with plural diverse separating means and a baffle for directing gas flow.

SEE OR SEARCH CLASS:

- 55, Gas Separation, subclasses 434+ for general gas separation apparatus with deflector means.
- 210, Liquid Purification or Separation, subclasses 285+ for liquid purification or separation apparatus of the particulate material type (e.g., ion exchange or sand bed, etc.) provided with at least one baffle completely or partially embedded in the particulate material.

**153 Dispersed or impregnated solid sorbent bed:**  
This subclass is indented under subclass 108. Apparatus in which the solid sorbent is (a) dispersed in a second sorbing or nonsorbing medium (e.g., sorbent particles bonded in a matrix or set in a mass of filler material, etc.) or (b) impregnated with a second nonsorbing material.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 135, for dispersed or impregnated solid sorbent beds combined with other basically diverse separating means.

SEE OR SEARCH CLASS:

- 502, Catalyst, Solid Sorbent, or Support Therefor: Product or Process of Making, appropriate subclasses for dispersed or impregnated solid sorbents, per se, and for the process of making the same. See section III of this class for the line between these two classes.

**154 Layered or laminated (e.g., solid sorbent on support material, etc.):**

This subclass is indented under subclass 108. Apparatus in which the solid sorbent is distributed as a distinct layer on or between laminates



of a second solid sorbent or nonsorbent support material.

**SEE OR SEARCH CLASS:**

502, Catalyst, Solid Sorbent, or Support Therefor: Product or Process of Making, appropriate subclasses for layered or laminated solid sorbent or support material, per se, and for the process of making the same. See section III of this class for the line between these two classes.

**155 DEGASIFYING MEANS FOR LIQUID:**

This subclass is indented under the class definition. Apparatus which is provided with means to eliminate or drive out a gas from a liquid.

- (1) Note. In order to distinguish the apparatus of this subclass from that used for distillation as found in Class 202, which is used to separate a liquid constituent by volatilization from a plurality of liquids, only degasifying means providing for the removal of a normally gaseous constituent at STP (i.e., standard temperature of 0°C and pressure of 760 mm Hg) from a liquid will be classified in this subclass. If, however, a constituent is at a temperature above its boiling temperature for a particular pressure, then the constituent is presumed to be a gas, and a patent to apparatus for removing the constituent will be placed here. See search class notes below.
- (2) Note. The apparatus of this subclass may be used to degasify a liquid which was formed as a result of a prior system treatment (e.g., regeneration of a liquid that was used to remove a gas from a plurality of gases, etc.).

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

134+, for degasifying means for liquid combined with solid sorbent apparatus.

**SEE OR SEARCH CLASS:**

95, Gas Separation: Processes, subclasses 156+ for processes of degasifying liquid combined with liquid contacting and subclasses 241+ for other processes of degasifying liquid.

- 202, Distillation: Apparatus, for apparatus used to separate liquids by volatilization, the most volatile of which must be a liquid above a temperature of 0°C at 760 mm Hg pressure.
- 210, Liquid Purification or Separation, for processes and apparatus for separating liquids.
- 261, Gas and Liquid Contact Apparatus, for apparatus used to mix liquids and gases by contacting.
- 266, Metallurgical Apparatus, subclasses 208+ for apparatus for treating liquefied metal by application of vacuum that may include degasification of the liquefied metal.
- 366, Agitating, for processes and apparatus providing agitation without degasification of liquid.

**156 With control means responsive to sensed condition:**

This subclass is indented under subclass 155. Apparatus in which means are provided to detect an apparatus or process characteristic or a change therein and to control or regulate operation of the apparatus or process based upon the detected characteristic or change therein.

- (1) Note. In this subclass and the subclasses indented hereunder, a single means may be used both to detect the characteristic or a change therein and to implement an action in the apparatus based upon the detected characteristic or change therein. There must be a positive action made by the means because of the detected characteristic or change therein. An example is a pressure relief valve in which a certain pressure must be reached before the valve opens to relieve pressure differential across the valve. Another example is a thermostat with a bimetallic element in which a certain temperature must be reached before the element is deformed enough to trip a switch, thus implementing a control action in the apparatus as a result of the temperature or change therein. Apparatus in which no positive action is made by the single means as a result of the detected characteristic or change therein is not classified in this



subclass or in the subclasses indented hereunder, but is classified below.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 18+, for electrical precipitators with similar control means.
- 102, for chromatography type apparatus with similar control means.
- 109+, for solid sorbent apparatus with similar control means.
- 397+, for other gas separation apparatus having automatic control means for gaseous or nongaseous constituent discharge.
- 417+, for other gas separation apparatus having signals, indicators, measuring, or testing means.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclasses 1+ for gas separation processes with control responsive to sensed condition, subclasses 25+ for processes with recording or signaling condition, and subclass 26 for processes with timing of operation.

#### **157 With liquid level sensing means:**

This subclass is indented under subclass 156. Apparatus which is provided with means to detect the height of a liquid level or a change therein and to control operation of the apparatus based upon the detected level or change therein.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 24 for processes with control responsive to sensed liquid level.

#### **158 Separator inlet or outlet valve responsive to float level:**

This subclass is indented under subclass 157. Apparatus in which a flow control member is positioned at a fluid inlet or outlet and is actuated as a result of change in position of a liquid level float.

SEE OR SEARCH CLASS:

- 137, Fluid Handling, subclasses 386+ for other liquid level responsive or maintaining systems.

#### **159 Plural floats:**

This subclass is indented under subclass 158. Apparatus which has more than one float for sensing liquid level.

#### **160 And temperature sensing means:**

This subclass is indented under subclass 159. Apparatus which is also equipped with means to detect temperature or a change therein and to control operation of the apparatus based upon the detected temperature or change therein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 112, for solid sorbent apparatus with control means responsive to sensed temperature.
- 173, for other liquid degasifying means with control means responsive to sensed temperature.
- 407, for other gas separation apparatus having temperature or humidity responsive automatic control means for gaseous or nongaseous constituent discharge.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclasses 14+ for gas separation processes with control responsive to sensed temperature.
- 236, Automatic Temperature and Humidity Regulation, for control apparatus of this type, per se.

#### **161 And pressure sensing means:**

This subclass is indented under subclass 159. Apparatus which is also equipped with means to detect pressure or a change therein and to control operation of the apparatus based upon the detected pressure or change therein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 113, for solid sorbent apparatus with control means responsive to sensed pressure.
- 164, 166, 169, 172, and 174, for other means to degasify liquid with control means responsive to sensed pressure.



## SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass  
15 and 19+ for processes with control  
responsive to sensed pressure.

**162 Plural float-controlled valves:**

This subclass is indented under subclass 158.  
Apparatus which has more than one valve actu-  
ated by a float detecting liquid level.

**163 At least one is gas outlet valve:**

This subclass is indented under subclass 162.  
Apparatus in which at least one of the valves is  
used to release gas removed from the liquid  
under treatment.

SEE OR SEARCH THIS CLASS, SUB-  
CLASS:

165+, for other means to degasify liquid  
with a gas outlet valve responsive to  
float level.

**164 And pressure sensing means:**

This subclass is indented under subclass 163.  
Apparatus which is also equipped with means  
to detect pressure or a change therein and to  
control operation of the apparatus based upon  
the detected pressure or change therein.

SEE OR SEARCH THIS CLASS, SUB-  
CLASS:

113, for solid sorbent apparatus with con-  
trol means responsive to sensed pres-  
sure.  
161, 166, 169, 172, and 174, for other  
means to degasify liquid with control  
means responsive to sensed pressure.

## SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass  
15 and 19+ for processes with control  
responsive to sensed pressure.

**165 Gas outlet valve responsive to float level:**

This subclass is indented under subclass 158.  
Apparatus in which a gas removed from the  
liquid under treatment is released through a  
valve controlled in response to the position of a  
liquid level float.

SEE OR SEARCH THIS CLASS, SUB-  
CLASS:

163+, for means to degasify liquid equipped  
with liquid level sensing means and  
plural valves, at least one of which is  
a gas outlet valve.

**166 And pressure sensing means:**

This subclass is indented under subclass 165.  
Apparatus which is also equipped with means  
to detect pressure or a change therein and to  
control operation of the apparatus based upon  
the detected pressure or change therein.

SEE OR SEARCH THIS CLASS, SUB-  
CLASS:

113, for solid sorbent apparatus with con-  
trol means responsive to sensed pres-  
sure.  
161, 164, 169, 172, and 174, for other  
means to degasify liquid and control  
means responsive to sensed pressure.

## SEE OR SEARCH CLASS:

95, Gas Separation: Processes, subclass  
15 and 19+ for processes with control  
responsive to sensed pressure.

**167 Centrifugal separating means:**

This subclass is indented under subclass 165.  
Apparatus in which means are provided to sep-  
arate entrained gas (e.g., bubbles, etc.) from the  
liquid under treatment by centrifugal force,  
causing the gas and liquid to rotate as by tan-  
gential flow about a central axis which forces  
the degasified liquid to move away from the  
axis and the separated gas to move toward the  
axis of rotation.

SEE OR SEARCH THIS CLASS, SUB-  
CLASS:

171, for tangential flow or centrifugal sep-  
arating means with liquid outlet valve  
responsive to float level.  
177+, for centrifugal or rotating defoaming  
means.  
195+, for centrifugal type flow modifier  
with means to reduce pressure.  
216, for centrifugal type means with flow  
slinger, spreader, disperser, or restric-  
tor.



## SEE OR SEARCH CLASS:

- 55, Gas Separation, subclasses 447+ for fixed gas whirler or rotator gas separating means.
- 95, Gas Separation: Processes, subclass 185 for liquid contacting processes with degasification of liquid by liquid flow modifying or mechanical agitating, and subclass 261 for processes of degasifying liquid by agitating or liquid flow modifying with the use of centrifugal force.

**168 Liquid outlet valve responsive to float level:**  
This subclass is indented under subclass 158. Apparatus in which degasified liquid is released through a valve controlled in response to the level of a liquid level float.

**169 And pressure sensing means:**  
This subclass is indented under subclass 168. Apparatus which is also equipped with means to detect pressure or a change therein and to control operation of the apparatus based upon the detected pressure or change therein.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 113, for solid sorbent apparatus with control means responsive to sensed pressure.
- 161, 164, 166, 172, and 174, for other means to degasify liquid with control means responsive to sensed pressure.

## SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 15 and 19+ for processes with control responsive to sensed pressure.

**170 And recycle means (e.g., for degasified liquid, etc.):**  
This subclass is indented under subclass 168. Apparatus which is also provided with means to recirculate fluid outside the means for degasifying liquid and return it to the same for secondary processing (e.g., recycling degasified liquid back to the apparatus inlet for further treatment, etc.).

- (1) Note. The recirculated fluid may be gas, liquid, or a mixture of the two (e.g., liquid which has not been completely

degasified may be recycled for further treatment, etc.).

## SEE OR SEARCH CLASS:

- 55, Gas Separation, subclasses 338+ for gas separation apparatus with recycle means.

**171 And tangential flow or centrifugal separating means:**

This subclass is indented under subclass 168. Apparatus (a) which is also provided with means for tangential fluid flow (e.g., having an inlet or outlet arranged for directing fluid flow about a central axis, etc.) or (b) in which means are provided to separate entrained gas from the liquid under treatment by centrifugal force, causing the gas and liquid to rotate about a central axis which forces degasified liquid to move away from the axis and separated gas to move toward the axis of rotation.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 167, for centrifugal separating means with gas outlet valve responsive to float level.
- 177+, for centrifugal or rotating defoaming means.
- 195+, for centrifugal type flow modifier with means to reduce pressure.
- 216, for centrifugal type means with flow slinger, spreader, disperser, or restrictor.

## SEE OR SEARCH CLASS:

- 55, Gas Separation, subclasses 447+ for fixed gas whirler or rotator gas separating means.
- 95, Gas Separation: Processes, subclass 185 for liquid contacting processes with degasification of liquid by liquid flow modifying or mechanical agitating and subclass 261 for processes of degasifying liquid by agitating or liquid flow modifying with the use of centrifugal force.

**172 With pressure sensing means:**

This subclass is indented under subclass 158. Apparatus which is equipped with means to detect pressure or a change therein and to control operation of the apparatus based upon the detected pressure or change therein.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 113, for solid sorbent apparatus with control means responsive to sensed pressure.
- 161, 164, 166, 169, and 174, for other means to degasify liquid with control means responsive to sensed pressure.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 15 and 19+ for processes with control responsive to sensed pressure.

**173 With temperature sensing means:**

This subclass is indented under subclass 156. Apparatus which is provided with means to detect temperature or a change therein and to control operation of the apparatus based upon the detected temperature or change therein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 112, for solid sorbent apparatus with control means responsive to sensed temperature.
- 160, for means to degasify liquid with separator inlet or outlet valve responsive to plural floats and temperature sensing means.
- 407, for other gas separation apparatus having temperature or humidity responsive automatic control means for gaseous or nongaseous constituent discharge.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclasses 14+ for gas separation processes with control responsive to sensed temperature.
- 236, Automatic Temperature and Humidity Regulation, for control apparatus of this type, per se.

**174 With pressure sensing means:**

This subclass is indented under subclass 156. Apparatus which is provided with means to detect pressure or a change therein and to control operation of the apparatus based upon the detected pressure or change therein.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 113, for solid sorbent apparatus with control means responsive to sensed pressure.
- 161, 164, 166, 169, and 172, for other means to degasify liquid with control means responsive to sensed pressure.
- 400+, for gas separation apparatus having gas pressure responsive automatic control means for gaseous or nongaseous constituent discharge.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 15 and 19+ for processes with control responsive to sensed pressure.

**175 Sonic means (i.e., using sound waves):**

This subclass is indented under subclass 155. Apparatus in which the separation is effected or enhanced by the energy of compressional vibratory waves in a fluid medium, the waves being below, within, or above the audible spectrum.

- (1) Note. Pressure pulses in a fluid generated merely by intermittent discharge of a gas are not considered to be compressional vibratory waves under this definition. However, compressional vibratory waves under this definition may be produced by intermittent discharge of a gas, as in a siren.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 176+, for defoaming apparatus not using sound waves.
- 389, for other gas separation apparatus using sound waves.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 30 for processes of degasifying liquid using sound waves.

**176 Defoaming means:**

This subclass is indented under subclass 155. Apparatus in which means are provided to remove a substantially stable aggregation of dispersed gas or vapor bubbles (e.g., froth or foam, etc.) from a liquid.



- (1) Note. In order to qualify under this definition, the liquid must be disclosed as containing a froth or foam prior to treatment. Apparatus for treating mixtures which may foam or merely contain a composition predisposed to produce a foam after agitation, etc., are classified below.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 175, for defoaming means using sound waves.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclass 157 for processes of gas separation with liquid contacting and defoaming, and subclass 242 for processes of degasifying liquid by defoaming.

#### **177 Centrifugal or rotating separator:**

This subclass is indented under subclass 176. Apparatus in which means are provided to separate entrained gas (e.g., bubbles, etc.) from the liquid under treatment (a) by centrifugal force, causing the gas or liquid to rotate as by tangential flow about a central axis which forces degasified liquid to move away from the axis and separated gas to move toward the axis of rotation or (b) by a rotating separator, causing the liquid to be agitated, breaking a liquid film surrounding the gas (i.e., foam) and liberating the entrained gas.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 167, for centrifugal separating means with gas outlet valve responsive to float level.  
171, for tangential flow or centrifugal separating means with liquid outlet valve responsive to float level.  
195+, for centrifugal type flow modifier with means to reduce pressure.  
216+, for centrifugal type means with flow slinger, spreader, disperser, or restrictor.

SEE OR SEARCH CLASS:

- 55, Gas Separation, subclasses 447+ for fixed gas whirler or rotator gas separating means.

- 95, Gas Separation: Processes, subclass 185 for liquid contacting processes with degasification of liquid by liquid flow modifying or mechanical agitating, and subclasses 260+ for processes of degasifying liquid by agitating or liquid flow modifying.

#### **178 Having flow-through foam restrictor or eliminator (e.g., screen, etc.):**

This subclass is indented under subclass 177. Apparatus which is also equipped with a porous screen or filter to remove foam (i.e., entrained gas bubbles) from the liquid passing therethrough by (a) physically excluding the foam or (b) breaking a liquid film surrounding entrained gas (i.e., foam) and liberating the entrained gas.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 179, for defoaming means having flow-through foam restrictor or eliminator without a centrifugal or rotating separator.

#### **179 Having flow-through foam restrictor or eliminator (e.g., screen, etc.):**

This subclass is indented under subclass 176. Apparatus which is equipped with a porous screen or filter to remove foam (i.e., entrained gas bubbles) from the liquid passing therethrough by (a) physically excluding the foam or (b) breaking a liquid film surrounding entrained gas (i.e., foam) and liberating the entrained gas.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 178, for defoaming means having flow-through foam restrictor or eliminator combined with a centrifugal or rotating separator.

#### **180 Having recycle means (e.g., for foam or separated liquid, etc.):**

This subclass is indented under subclass 176. Apparatus which is provided with means to redirect a fluid flowing from a separation stage back through an apparatus inlet for secondary processing, as in the recycle of collected foam or the corresponding separated liquid back to an apparatus inlet for further treatment.



## SEE OR SEARCH CLASS:

- 55, Gas Separation, subclasses 338+ for gas separation apparatus with recycle means.

**181 And liquid contact means:**

This subclass is indented under subclass 155. Apparatus in which means are provided to contact a gaseous fluid mixture with a liquid in order to remove a gas from the gaseous fluid mixture and means are provided to remove the gas from the liquid.

- (1) Note. An example of such means would be an extended surface for enhanced liquid contact with a gaseous fluid mixture to scrub or sorb a constituent from the gaseous fluid mixture, followed by separate means for degasifying the liquid.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

- 52, for electrical separation apparatus with means for vapor or liquid contact.
- 120, for soluble or deliquescent solid sorbent apparatus with means to contact a liquid containing dissolved solid sorbent with a gaseous fluid mixture.
- 243+, for other gas separation apparatus using liquid contact means combined with means to further handle process constituents before, during, or after separation. See the search class note to Class 261 below.

## SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclasses 149+ for processes of gas separation with liquid contacting.
- 261, Gas and Liquid Contact Apparatus, for gas and liquid contact apparatus, per se, with or without separation, and for gas and liquid contact processes, per se, without separation (e.g., humidification, etc.). See the class line to Class 261 in section III of this class for further details about gas and liquid contact apparatus and processes.

**182****With separator for multiple liquids:**

This subclass is indented under subclass 155. Apparatus which includes means to separate a mixture of two or more liquids.

- (1) Note. The separation may be a physical separation into two bodies having a fluid interface or may include one or more liquid phases retained in a separating media (e.g., filter, etc.), leaving the remaining liquid as a separate unretained phase.

## SEE OR SEARCH CLASS:

- 55, Gas Separation, subclass 421 for other types of gas separation apparatus in which a plurality of liquids are separated from each other.
- 95, Gas Separation: Processes, subclass 253 for processes of degasifying a liquid in which a plurality of liquids are separated from each other.
- 202, Distillation: Apparatus, for distillation apparatus, per se.
- 203, Distillation: Processes, Separatory, subclasses 43+ for separatory distillation processes including a step of removing a distillate or residue by liquid-liquid extraction, and other appropriate subclasses for processes in which a distillate includes two immiscible liquids which are separated.
- 210, Liquid Purification or Separation, for processes and apparatus of separating or purifying liquids, per se.

**183****Reservoir with three or more outlets, each for different fluid:**

This subclass is indented under subclass 182. Apparatus which is constructed with a container or compartment having at least three discharge conduits, each conduit passing a fluid which differs in state or nature from each other fluid passing in other conduits.

**184****Horizontal reservoir:**

This subclass is indented under subclass 183. Apparatus in which the longest axis of the reservoir is in a horizontal plane.

**185****With heat exchange means:**

This subclass is indented under subclass 183. Apparatus which includes a means to heat or cool a system fluid.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 201, for liquid degasification apparatus with heat exchange means and pressure reducing means.
- 218, for other liquid degasification apparatus with heat exchange means.

SEE OR SEARCH CLASS:

- 210, Liquid Purification and Separation, subclasses 175+ for apparatus and 774+ for processes for separating liquids or solids from liquids with the aid of heat exchange means.

**186 And internal filter or screen (e.g., coalescer, etc.):**

This subclass is indented under subclass 185. Apparatus which also includes a filter or screen, such as a coalescer device, inside the reservoir.

**187 Tank or tank part movably mounted on support (e.g., for deaerating aircraft lubricating oil, etc.):**

This subclass is indented under subclass 155. Apparatus in which degasification occurs in a reservoir, the whole or any part (e.g., inlet or outlet pipe, inner casing, etc.) of which is arranged for movement relative to a fixed support.

- (1) Note. Patents dealing with the problem of removing air from the oil system of an aircraft which assumes various positions in flight are found here.

**188 Including means to remove mist entrained in gas:**

This subclass is indented under subclass 155. Apparatus which is provided with a member or members in a gas outlet flow path acting to remove entrained liquid droplets from a gas.

SEE OR SEARCH CLASS:

- 55, Gas Separation, subclasses 434+ and appropriate subsequent other subclasses for structure of the means to remove mist, per se.
- 203, Distillation: Processes, Separatory, subclass 40 for distillation processes directed to removing entrained particles of liquid from a vapor.

**189 Baffle, filter, or screen:**

This subclass is indented under subclass 188. Apparatus which comprises (a) a static solid surface interposed in the gas flow path on which the gas impinges, or (b) a mass or member through which the gas passes and which retains the liquid droplets.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 197+, and 220, for other liquid degasifying means with a baffle type deflector.
- 219, for liquid degasifying means with a fluid filter.

SEE OR SEARCH CLASS:

- 55, Gas Separation, subclasses 434+, 490+, 520, and 521 for the structure of a deflector or filter, per se, for separating a constituent from a gaseous fluid mixture; and subclasses 522+ for the specific material used in a deflector or filter.

**190 Plural, serially arranged:**

This subclass is indented under subclass 189. Apparatus which comprises at least two similar or dissimilar baffles, filters, or screens, with one arranged downstream from the other in the gas flow path.

**191 Concentric tubular members:**

This subclass is indented under subclass 190. Apparatus in which the baffles, filters, or screens are in the form of tubes of different diameters, all having a common axis.

SEE OR SEARCH CLASS:

- 55, Gas Separation, subclass 441 for a similar arrangement of tubes of different diameters for reversing the flow of a fluid mixture to separate a constituent therefrom.

**192 Alternate central and peripheral gas paths:**

This subclass is indented under subclass 190. Apparatus in which the baffles, filters, or screens comprise two or more members arranged to direct the gas flow through the center of one member and around the outside of the next adjacent downstream member to provide a gas flow path that is alternately central and peripheral to the members placed in series.



**193 Pressure reducing means:**

This subclass is indented under subclass 155. Apparatus which decreases pressure acting on the liquid to cause or facilitate degasification of the liquid.

**SEE OR SEARCH CLASS:**

95, Gas Separation: Processes, subclasses 172+, 247+, and 266 for gas separation processes of various types involving a decrease in pressure acting on a liquid.

**194 And liquid flow modifier:**

This subclass is indented under subclass 193. Apparatus which is also provided with a means to change or alter the liquid flow path within the apparatus.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

204+, for liquid degasifying means with a flow slinger, spreader, deflector, disperser, or rotation modifier.

**SEE OR SEARCH CLASS:**

95, Gas Separation: Processes, subclasses 248+ for liquid degasification processes with flow modification and pressure varying.

**195 Centrifugal type:**

This subclass is indented under subclass 194. Apparatus which (a) separates a fluid mixture by centrifugal force causing the fluid mixture to spin or whirl as by tangential flow about a central axis, forcing denser fluids away from the axis and remaining fluids closer to the axis of rotation, or (b) rotates or causes the fluid mixture to spin or whirl as by tangential flow about a central axis.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

167, 171, 177+, 208+, and 216+, for centrifugal type separators of this class combined with other features.

**SEE OR SEARCH CLASS:**

55, Gas Separation, subclasses 447+ for other gas separation apparatus in which the fluid mixture is caused to

spin or turn about an axis to separate a constituent therefrom.

**196 Rotating means:**

This subclass is indented under subclass 195. Apparatus which is provided with a helical screw, impeller, or other means on a rotating shaft.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

167, 171, 177+, 208+, and 216+, for centrifugal type degasifying means combined with other features.

**SEE OR SEARCH CLASS:**

55, Gas Separation, subclasses 447+ for other gas separation apparatus in which the fluid mixture is caused to spin or turn about an axis to separate a constituent therefrom.

**197 Baffle:**

This subclass is indented under subclass 194. Apparatus in which the means to alter the liquid flow path is a static solid surface member (e.g., deflector, etc.).

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

189+, and 220, for other liquid degasification means with a baffle type deflector.

**SEE OR SEARCH CLASS:**

55, Gas Separation, subclasses 434+ for the structure of the static solid surface member.

**198 Plural baffles in series:**

This subclass is indented under subclass 197. Apparatus which comprises a plurality of such static solid surface members arranged with each member downstream from the previous member in the liquid flow path.

**SEE OR SEARCH CLASS:**

55, Gas Separation, subclasses 442+ for plural deflectors serially spaced in a gas stream to separate a constituent therefrom.



**199 With heat exchange means:**

This subclass is indented under subclass 198. Apparatus which is provided with means to heat or cool a constituent of the fluid mixture.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 201, for means to degasify liquid with pressure reducing and heat exchange means.
- 218, for means to degasify liquid by heat exchange.

**200 Spray nozzle:**

This subclass is indented under subclass 194. Apparatus which has a nozzle to disperse the liquid under treatment into smaller particles.

- (1) Note. The liquid under treatment may either pass through the nozzle or be broken up by a second fluid which is sprayed from the nozzle onto a stream of the liquid under treatment.

SEE OR SEARCH CLASS:

- 239, Fluid Sprinkling, Spraying, and Diffusing for the nozzle structure, per se.

**201 With heat exchange means:**

This subclass is indented under subclass 193. Apparatus which is also provided with means to heat or cool a constituent of the fluid mixture.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 199, for means to degasify liquid having heat exchange means, plural baffles in series, and means for reduction of pressure.
- 218, for general apparatus to degasify liquid by heat exchange means.

**202 With gas contacting means:**

This subclass is indented under subclass 155. Apparatus which is also provided with means to pass a gas through or in contact with the liquid.

- (1) Note. The gas contacting means may or may not cause gas to separate from the liquid.

SEE OR SEARCH CLASS:

- 95, Gas Separation: Processes, subclasses 159+ for processes of liquid contacting and degasifying liquid by stripping with a gas, and subclasses 245+ and 263+ for other processes of degasifying liquid with the use of a stripping gas.
- 261, Gas and Liquid Contact Apparatus, appropriate subclasses for apparatus for degasifying liquid (e.g., deaerating feed water heater, etc.) wherein the liquid is merely contacted with a gas in a chamber or space for deaeration thereof. If apparatus for degasifying liquid by contact with a gas has other means to cause gas separation of the liquid with gas entrained therein, of the separated gas, or of the separated liquid, then the apparatus is classified in Class 96. See section III of this class for an amplification of the line between these two classes.

**203 Spray nozzle:**

This subclass is indented under subclass 202. Apparatus which has a nozzle to disperse the liquid under treatment into smaller particles.

**204 Liquid flow slinger, spreader, deflector, disperser, or rotation modifier:**

This subclass is indented under subclass 155. Apparatus which is a liquid flow modifier comprising (a) a moving member used to throw the liquid in the form of drops or spray, (b) a member which causes the liquid to flow in a thin, laminar stream, (c) a solid member on which the liquid impinges and is deflected, (d) a member which causes the liquid to assume a spray or mistlike form, or (e) a member which causes a spinning or whirling motion to be imparted to or removed from the flowing liquid.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 194+, for liquid degasifying apparatus with a flow modifier and pressure reducing means.
- 220, for other degasifying apparatus including a baffle.



## SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 434+ for a deflecting or dispersing member, per se, separating a constituent from a fluid stream.

**205 And preliminary heat exchange means:**

This subclass is indented under subclass 204. Apparatus in which a means to heat or cool a constituent of the fluid mixture is positioned in the apparatus to precede the flow slinger, spreader, deflector, disperser, or rotation modifier.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

201, for heat exchange means combined with pressure reducing means.  
218, for means to degasify liquid by heat exchange.

**206 At inlet to separator:**

This subclass is indented under subclass 204. Apparatus in which the liquid flow modifier is positioned within, at, or around the discharge end of an inlet conduit to the apparatus.

**207 Plural, serially arranged:**

This subclass is indented under subclass 206. Apparatus in which two or more flow modifying means are arranged downstream of one another.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

190+, for means to degasify liquid with plural, serially arranged baffles, filters, or screens to remove mist entrained in a gas.  
198+, for means to degasify liquid with plural baffles in series and pressure reducing means.

## SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 442+ for plural deflectors overlapped and spaced serially in a gas flow.

**208 Centrifugal type:**

This subclass is indented under subclass 206. Apparatus which (a) separates a fluid mixture by centrifugal force causing the fluid mixture to spin or whirl as by tangential flow about a

central axis, forcing denser fluids away from the axis and remaining fluids closer to the axis of rotation, or (b) rotates or causes a fluid mixture to spin or whirl as by tangential flow about a central axis.

## SEE OR SEARCH THIS CLASS, SUBCLASS:

216+, for a centrifugal type flow slinger, spreader, deflector, disperser, or rotation modifier not located at an inlet to the degasifying apparatus.

## SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 447+ for means which cause a gaseous stream to whirl or rotate to separate a constituent therefrom.

**209 Tangential inlet:**

This subclass is indented under subclass 208. Apparatus in which an inlet is arranged to direct inflow along a path other than one which intersects or is parallel to the longitudinal axis of the apparatus casing.

**210 Including tangential outlet:**

This subclass is indented under subclass 209. Apparatus in which an outlet fluid flow conduit is also tangential to the apparatus casing.

**211 Split or plural inlets:**

This subclass is indented under subclass 209. Apparatus in which (a) the inlet is split or divided at its discharge end or (b) more than one inlet is provided, at least one of which is tangential to the apparatus casing.

**212 Including inner and outer casings or plural compartments:**

This subclass is indented under subclass 209. Apparatus which is provided with (a) two or more casings, at least one being completely enclosed within the other, or (b) two or more separate compartments within a single casing.

**213 Tangential outlet:**

This subclass is indented under subclass 208. Apparatus in which an outlet is arranged with an axis in a direction other than one which intersects or is parallel to the longitudinal axis of the casing.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

210, for apparatus with both tangential inlet and outlet.

**214 Rotating means:**

This subclass is indented under subclass 208. Apparatus which is provided with a helical screw, impeller, or other means on a rotating shaft.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

167, 171, 177+, 195+, and 216+, for centrifugal type degasifying means combined with other features.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 447+ for other types of gas separation apparatus in which a fluid mixture is caused to spin or turn about an axis to separate a constituent therefrom.

**215 Plural, serially arranged:**

This subclass is indented under subclass 204. Apparatus in which two or more liquid flow modifiers are arranged downstream of one another.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

190+, and 198+, for other plural, serially arranged members on which a fluid mixture impinges for separating a constituent therefrom.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 442+ for plural deflecting surfaces spaced serially in a gas stream to separate a constituent therefrom.

**216 Centrifugal type:**

This subclass is indented under subclass 204. Apparatus which (a) separates a fluid mixture by centrifugal force causing the fluid mixture to spin or whirl as by tangential flow about a central axis, forcing denser fluids away from the axis and remaining fluids closer to the axis of rotation, or (b) rotates or causes a fluid mixture to spin or whirl as by tangential flow about a central axis.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

208, for a centrifugal type flow slinger, spreader, deflector, disperser, or rotation modifier located at an inlet to the degasifying apparatus.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 447+ for means which cause a gas to whirl or rotate to separate a constituent therefrom.

**217 Impeller or screw on rotating shaft:**

This subclass is indented under subclass 216. Apparatus which is provided with a helical screw or impeller on a rotating shaft.

SEE OR SEARCH CLASS:

55, Gas Separation, subclasses 456+ for fixed gas whirler or rotator means in the form of a helical vane or baffle within a flow conduit.

**218 Heat exchanger to degasify:**

This subclass is indented under subclass 155. Apparatus which is provided with a heat exchanger to liberate gas from the liquid under treatment.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

185+, 199, 201, and 205, for means degasifying liquid with nonseparatory heat exchange means.

**219 And fluid filter:**

This subclass is indented under subclass 155. Apparatus which is provided with a fluid filter for either the liquid under treatment or a gas separated therefrom.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

179, 186, and 189+, for other means for degasifying liquid also having a filter or screen member.

SEE OR SEARCH CLASS:

55, Gas Separation, appropriate subclasses for various gas filters, per se, and the structures and materials associated therewith.



- 210, Liquid Purification or Separation, appropriate subclasses for various liquid filters, per se, and structures and materials associated therewith.
- 220 Including baffle:**  
This subclass is indented under subclass 155. Apparatus which is provided with a static solid surface member to direct the flow of liquid under treatment or a gas separated therefrom.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
189+, and 197+, for other means for degasifying a liquid combined with a baffle.
- SEE OR SEARCH CLASS:  
55, Gas Separation, subclasses 434+ for gas separation apparatus with various types of deflectors.
- 221 COLD WALL - HOT WALL THERMAL DIFFUSION-TYPE SEPARATOR:**  
This subclass is indented under the class definition. Apparatus having surfaces of different temperatures between which a gaseous fluid mixture passes, with the different temperatures of the surfaces causing separation of constituents of the gaseous fluid mixture by migration of the constituents to one surface or another.
- (1) Note. This subclass takes this special type of gas separating apparatus, regardless of any claimed refrigeration apparatus.
- SEE OR SEARCH CLASS:  
95, Gas Separation: Processes, subclass 289 for corresponding processes. Patents are not cross-referenced from Class 95, subclass 289 to this subclass based only on disclosure. Therefore, relevant disclosures for gas separation apparatus may be found in the process area.
- 210, Liquid Purification or Separation, subclass 176 and 775 for similar apparatus and methods to separate components of a liquid mixture.
- 222 WITH MEANS TO ADD FRAGRANCE OR SCENT:**  
This subclass is indented under the class definition. Apparatus having means to add a chemical having a pleasant odor to a gaseous fluid mixture or separated constituent.
- (1) Note. The added chemical may be a deodorant used to mask an unpleasant odor in the gaseous fluid mixture or separated constituent.
- 223 WITH STERILIZING MEANS:**  
This subclass is indented under the class definition. Apparatus having means acting to render apparatus parts or a gaseous fluid mixture or its constituent parts passing through or being delivered from the apparatus in a condition free from bacteria or other microorganisms.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
16, for electric field separation apparatus including an ultraviolet light ionizer.
- SEE OR SEARCH CLASS:  
422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, appropriate subclasses for sterilizing devices. See the SEARCH CLASS notes in the Class Definition of Class 96 for the line between these two classes.
- 224 Germicidal lamp (e.g., ultraviolet light, etc.):**  
This subclass is indented under subclass 223. Apparatus in which the sterilizing means is a light whose radiation kills bacteria or other microorganisms.
- 225 Heater (e.g., electrical, steam, etc.):**  
This subclass is indented under subclass 223. Apparatus in which the sterilizing means causes an increase in the temperature of the apparatus parts or the gaseous fluid mixture or its constituent parts in order to kill bacteria or other microorganisms.
- 226 Means uses chemical antimicrobial agent:**  
This subclass is indented under subclass 223. Apparatus in which the sterilizing means uses a chemical substance that kills bacteria or other



microorganisms on the apparatus parts or in the gaseous fluid mixture or its constituent parts.

**227 Liquid agent:**

This subclass is indented under subclass 226. Apparatus in which the antimicrobial agent is a liquid.

**228 WITH MEANS USING LIQUID TO CLEAN SEPARATING APPARATUS:**

This subclass is indented under the class definition. Apparatus in which means are provided to apply a liquid (e.g., by sprinkling, projecting, washing down, submerging in a bath, etc.) to a separating apparatus in order to remove a separated constituent from the separating apparatus.

- (1) Note. Cleaning the separating apparatus by contact with steam is not considered to be the use of liquid to clean the separating apparatus.

**SEE OR SEARCH CLASS:**

- 55, Gas Separation, subclasses 282+ for nonliquid cleaning means for separating media (e.g., means using steam, etc.); subclass 431 for contacting an apparatus part with a fluid for manipulating or transporting a collected mass of nongaseous residue; subclass 466 for treating the residue by a liquid.
- 95, Gas Separation: Processes, subclass 276 and 281 for processes of gas separation with cleaning of a filter by use of a liquid.

**229 Movably mounted cleaning liquid distributor:**

This subclass is indented under subclass 228. Apparatus having a continuously or intermittently moving discharging or applying means to apply the cleaning liquid along a surface of the separating apparatus.

**230 Movable separating media:**

This subclass is indented under subclass 228. Apparatus in which the separating apparatus includes a separating media that has means to change its position.

**231 Immersion cleaning:**

This subclass is indented under subclass 230. Apparatus in which the movable separating media has a means for dipping or submerging the separating media in a liquid bath.

**232 Parallel vanes or baffles:**

This subclass is indented under subclass 228. Apparatus in which the separating apparatus includes a separating media that is formed either of at least two slanted plates that are an equal distance apart at every point between which a gaseous fluid mixture flows (e.g., louver, etc.) that are constructed to provide substantially constant area for flow of the gaseous fluid mixture or of at least two plates that are an equal distance apart at every point between which a gaseous fluid mixture flows in a tortuous or sinuous path, the plates being bent, deformed, or provided with projections, and arranged relatively one to the other so that a bend, deformation, or projection of one plate is spaced from the corresponding bend, deformation, or projection of the other, so as to provide substantially constant area for the flow of the gaseous fluid mixture.

**SEE OR SEARCH CLASS:**

- 55, Gas Separation, subclass 440 for parallel vane separation apparatus not having liquid cleaning means.

**233 Filter:**

This subclass is indented under subclass 228. Apparatus in which the separating apparatus includes a separating media that is a foraminous or porous mass which separates solid or liquid particles from the gaseous fluid mixture by entrapment and retention while permitting gaseous or vaporous constituents to pass through.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclass 276 and 281 for processes of gas separation using a filter with cleaning of the filter by use of a liquid.

**234 GAS AND LIQUID CONTACT APPARATUS FOR GAS SEPARATION INCLUDING MEANS TO REGENERATE,**



**PURIFY, OR SEPARATE CONTACT LIQUID:**

This subclass is indented under the class definition. Apparatus having means in which a gaseous fluid mixture is contacted with a liquid in order to remove a constituent from the gaseous fluid mixture and includes means to restore the contact liquid to its original condition, to cleanse the contact liquid in order to rid the contact liquid of the constituent that was removed from the gaseous fluid mixture, or to remove from the contact liquid the constituent that was removed from the gaseous fluid mixture.

- (1) Note. After the contact liquid is regenerated, purified, or separated, the contact liquid may be reused for further gas and liquid contact or the contact liquid may be discarded. The constituent removed from the gaseous fluid mixture, after its removal from the contact liquid, may be used or discarded.

**SEE OR SEARCH CLASS:**

- 210, Liquid Purification or Separation, for liquid purification or separation, per se.  
261, Gas and Liquid Contact Apparatus, for gas and liquid contact apparatus, per se. See the SEARCH CLASS notes in the Class Definition of Class 96 for the line between these two classes.

**235 Means to add conditioning agent to contact liquid:**

This subclass is indented under subclass 234. Apparatus in which the means to regenerate, purify, or separate the contact liquid consists of a means for adding an agent to the contact liquid that causes or aids the contact liquid to be modified (e.g., cleaned, etc.).

**SEE OR SEARCH CLASS:**

- 210, Liquid Purification or Separation, subclasses 198.1+ for the addition of a treating medium to a liquid separation or purification apparatus.

**236 Gravitational separator for contact liquid:**  
This subclass is indented under subclass 234. Apparatus in which the means to regenerate, purify, or separate the contact liquid consists of

means in which the contact liquid and the constituent removed from the gaseous fluid mixture are separated from one another by forming component layers in accordance with their respective specific gravities.

**SEE OR SEARCH CLASS:**

- 210, Liquid Purification or Separation, subclasses 513+ for apparatus for gravitational separation of a liquid, per se.

**237 With heavier component mechanical mover, trap, chamber, or recess in gravitational separator:**

This subclass is indented under subclass 236. Apparatus in which the gravitational separator includes a means to provide a change in position, produced by a part of the apparatus, of the component having the higher density or a receptacle, compartment, or small hollow for collecting the component having the higher density.

**SEE OR SEARCH CLASS:**

- 210, Liquid Purification or Separation, subclasses 523+ for a mechanical constituent mover in a gravitational liquid separation apparatus and subclasses 532.1+ for a heavier component trap, chamber, or recess in a gravitational liquid separation apparatus.

**238 With lighter component removal means in gravitational separator:**

This subclass is indented under subclass 236. Apparatus in which the gravitational separator includes a discharge opening or a separate physical element for removing the component having the lower density.

**SEE OR SEARCH CLASS:**

- 210, Liquid Purification or Separation, subclasses 538+ for a lighter component trap in a gravitational liquid separation apparatus.

**239 With baffle, plate, or weir within gravitational separator to aid contact liquid regeneration, purification, or separation:**

This subclass is indented under subclass 236. Apparatus in which the gravitational separator includes a surface in the contact liquid flow



path to be contacted by the contact liquid for redirecting or altering the contact liquid flow path within the gravitational separator to facilitate gravitational separation or to facilitate other contact liquid regeneration or purification.

**SEE OR SEARCH CLASS:**

210, Liquid Purification or Separation, subclasses 521+ for superposed baffles in a gravitational liquid separation apparatus.

**240 Filter for contact liquid:**

This subclass is indented under subclass 234. Apparatus in which the means to regenerate, purify, or separate the contact liquid is a foraminous or porous mass which separates the constituent from the contact liquid by entrapment and retention while permitting the contact liquid to pass through.

**SEE OR SEARCH CLASS:**

210, Liquid Purification or Separation, subclasses 348+ for a filter in a liquid separation apparatus.

**241 Including filter adjusting or removal means:**

This subclass is indented under subclass 240. Apparatus including means to change the position or porosity of the filter or to remove the filter (e.g., for cleaning, substitution, or disposal).

**SEE OR SEARCH CLASS:**

210, Liquid Purification or Separation, subclasses 470+ for a filter with a handle in a liquid purification or separation apparatus.

**242 Heating or cooling means:**

This subclass is indented under subclass 234. Apparatus in which the means for regeneration, purification, or separation of the contact liquid includes means for raising or lowering the temperature of the contact liquid.

**SEE OR SEARCH CLASS:**

210, Liquid Purification or Separation, subclasses 175+ for a heater or heat exchanger in a liquid purification or separation apparatus.

**243 WITH GAS AND LIQUID CONTACT APPARATUS:**

This subclass is indented under the class definition. Apparatus having means to cause separation of a gaseous fluid mixture combined with means to bring the gaseous fluid mixture or a separated gaseous constituent into (1) intimate confluent, countercurrent, or generally mingling relationship with a contact liquid or (2) into contact with the surface of a reservoir or supply tank of a contact liquid.

(1) Note. The means for contacting the gaseous fluid mixture with a liquid generally results in separation of a gas, solid particles, or liquid particles from the gaseous fluid mixture (e.g., sorption, scrubbing, etc.). However, the means for contacting the gaseous fluid mixture with a liquid does not have to cause separation of the gaseous fluid mixture, but may be used for other reasons (e.g., to humidify a gas, etc.). In order for a patent to be placed in this subclass, there must be means to cause separation of the gaseous fluid mixture by some apparatus of this class combined with the means to cause gas and liquid contact (e.g., a liquid bath combined with a filter or deflector for mist elimination, a filter combined with a liquid sprayer for humidification, etc.). Gas and liquid contact apparatus, per se, for gas separation or for other reasons is classified elsewhere (see the SEARCH CLASS note below).

(2) Note. In order to qualify under portion (1) of this definition, the gas and liquid contact apparatus must be of the type described as classified, per se, elsewhere (see the SEARCH CLASS note below).

**SEE OR SEARCH CLASS:**

95, Gas Separation: Processes, subclasses 149+ for processes of gas separation involving liquid contact.  
261, Gas and Liquid Contact Apparatus, appropriate subclasses for gas and liquid contact apparatus wherein means for gas and liquid contact is the only physical gas separation means involved. See the SEARCH CLASS



notes in the Class Definition of Class 96 for the line between these two classes. (Also see the (1) Note and (2) Note above.)

**244 With control means responsive to sensed condition:**

This subclass is indented under subclass 243. Apparatus in which means are provided to detect an apparatus or a process characteristic or a change therein and to control or regulate operation of the apparatus or process based upon the detected characteristic or change therein.

- (1) Note. In this subclass and the subclasses indented hereunder, a single means may be used both to detect the characteristic or a change therein and to implement an action in the apparatus based upon the detected characteristic or change therein. There must be a positive action made by the apparatus because of the detected characteristic or change therein. An example is a liquid height sensor which opens or closes a valve when a certain level is reached. Another example is a pressure valve in which a certain pressure must be reached before the valve opens to relieve the pressure differential across the valve. Apparatus in which no positive action is made by the single means as a result of the detected characteristic or change therein is not classified in this subclass or in the subclasses indented hereunder, but is classified below. An example of such means would be an overflow means which maintains the height of liquid within a vessel, but without means for implementing any action in the vessel.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

- 18+, for electric field separation apparatus with control means responsive to sensed condition.  
102, for chromatographic type apparatus with control means responsive to sensed condition.  
109+, for solid sorbent apparatus with control means responsive to sensed condition.

- 156+, for apparatus degasifying liquid with control means responsive to sensed condition.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclasses 1+ for gas separation processes having control responsive to sensed condition.

**245 Contact liquid level sensing means:**

This subclass is indented under subclass 244. Apparatus which is provided with means to detect height of the contact liquid or a change therein and to control operation of the apparatus or process based upon the detected height or change therein.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

- 157+, for degasifying apparatus with control means responsive to liquid level.

**SEE OR SEARCH CLASS:**

- 95, Gas Separation: Processes, subclass 24 for processes in which liquid level or a change therein is detected and used to control some aspect of the process.

**246 By pressure sensing means:**

This subclass is indented under subclass 245. Apparatus having means which senses pressure created by the height of the contact liquid or senses a change in pressure created by a change in the height of the contact liquid in order to detect the height of the contact liquid or a change therein.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

- 113+, for solid sorbent apparatus with control means responsive to pressure.  
174, for degasifying means for liquid with control means responsive to pressure.  
253, for gas separation apparatus combined with gas and liquid contact apparatus having control means responsive to pressure, wherein the contact liquid level is not sensed.



## SEE OR SEARCH CLASS:

95, Gas Separation: Processes, sub-classes 19+ for processes in which pressure or a change therein is detected and is used to control some aspect of the process.

**247 Valve responsive to float level:**

This subclass is indented under subclass 245. Apparatus having a valve, controlled in response to position of a liquid level float, through which the gaseous fluid mixture, a separated constituent, or the contact liquid is released.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

158+, for degasifying means for liquid with an inlet or outlet valve responsive to float level.

**248 Plural floats:**

This subclass is indented under subclass 247. Apparatus which has more than one float for sensing liquid level.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

159+, for liquid degasifying means having plural floats.

**249 Contact liquid inlet valve responsive to float level:**

This subclass is indented under subclass 247. Apparatus in which the float controls addition of the contact liquid through a liquid inlet valve.

**250 Contact liquid outlet valve responsive to float level:**

This subclass is indented under subclass 247. Apparatus in which the float controls discharge of the contact liquid through a liquid outlet valve.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

168, for degasifying means for liquid with a liquid outlet valve responsive to float level.

**251****Temperature sensing means:**

This subclass is indented under subclass 244. Apparatus which is provided with means to detect temperature or a change therein and to control operation of the apparatus or process based upon the detected temperature or change therein.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

112, for solid sorbent apparatus with temperature sensing means.

173, for degasifying means for liquid with temperature sensing means.

**252****Gas flow rate sensing means:**

This subclass is indented under subclass 244. Apparatus which is provided with means to detect flow rate of the gaseous fluid mixture or the separated gaseous constituent or a change therein and to control operation of the apparatus or process based upon the detected flow rate of the gaseous fluid mixture or the separated gaseous constituent or change therein.

(1) Note. The gas flow rate may be used to actuate or start the addition of the contact liquid or to control the amount of contact liquid added to the flowing gas stream.

**253****Pressure sensing means:**

This subclass is indented under subclass 244. Apparatus which is provided with means to detect pressure or a change therein and to control operation of the apparatus or process based upon the detected pressure or change therein.

## SEE OR SEARCH THIS CLASS, SUB-CLASS:

113+, for solid sorbent apparatus with control means responsive to pressure.

174, for degasifying means for liquid with control means responsive to pressure.

246, for gas separation apparatus combined with gas and liquid contact apparatus having contact liquid level sensing by pressure sensing means.

## SEE OR SEARCH CLASS:

95, Gas Separation: Processes, sub-classes 19+ for gas separation processes in which pressure or a change



therein is detected and is used to control some aspect of the process.

**254 Pressure sensitive diaphragm:**

This subclass is indented under subclass 253. Apparatus in which the pressure sensing means is a reciprocating member in the form of a flat or cup-shaped member of relatively thin deformable material secured at its periphery to its housing.

**SEE OR SEARCH CLASS:**

251, Valves and Valve Actuation, subclass 331 for specific structure of the reciprocating diaphragm valve, per se.

**255 With programmed, cyclic, or time responsive control means:**

This subclass is indented under subclass 243. Apparatus which is provided with control means for (a) storing coded instructions or other data necessary to regulate operation of the apparatus, (b) repetitively regulating a sequence of operational steps performed in or by the apparatus, or (c) causing various operations to occur according to preset timing sequences or to last for predetermined durations (e.g., timer switches, etc.).

(1) Note. The control means is not directly responsive to a sensed condition.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

25, for electric field separation apparatus with programmed, cyclic, or time responsive control means.  
103, for gas chromatography type apparatus with programmed, cyclic, or time responsive control means.  
114, and 115+, for solid sorbent apparatus with programmed, cyclic, or time responsive means.

**256 Contact liquid movement by flowing gas force:**

This subclass is indented under subclass 243. Apparatus having means in which the movement of contact liquid to, from, or within the apparatus is effected by the velocity or pressure of flow of the gaseous fluid mixture or the separated gaseous constituent (e.g., a venturi through which the gaseous fluid mixture passes and which educes the contact liquid, etc.).

**257 Including means varying gas flow to control saturation or dispersion:**

This subclass is indented under subclass 243. Apparatus which is provided with direct response or other nonautomatic control means for the gaseous fluid mixture or the separated gaseous constituent to alter or determine the amount of contact liquid carried or retained by the gaseous fluid mixture or the separated gaseous constituent by changing flow rate of the gaseous fluid mixture or the separated gaseous constituent through or from the apparatus.

**258 Pivotal means:**

This subclass is indented under subclass 257. Apparatus in which the varying means is an apparatus part having a rod or shaft about which the part rotates or swings in order to vary size of a space between the apparatus part having the rod or shaft and other parts of the apparatus to change flow rate of the gaseous fluid mixture or the separated gaseous constituent through the apparatus.

**259 About an end:**

This subclass is indented under subclass 258. Apparatus in which the rod or shaft about which the part rotates or swings is at an outside edge of the part.

**260 Axially moveable means:**

This subclass is indented under subclass 257. Apparatus in which the varying means moves in a direction parallel to the flow of the gaseous fluid mixture or the separated gaseous constituent to various positions in order to vary the size of a space between apparatus parts to change flow rate of the gaseous fluid mixture or the separated gaseous constituent through the apparatus.

**261 Conically or frustoconically shaped:**

This subclass is indented under subclass 260. Apparatus in which the axially moveable means is shaped like a cone (i.e., a means having a surface that has circular cross sections of increasing diameter) or a part of a cone formed by two parallel planes cutting a cone (e.g., the section between the base and a plane parallel to the base, etc.).



**262 Having contact liquid level maintaining means (e.g., weir, wall openings, tubes, gates, etc.):**

This subclass is indented under subclass 243. Apparatus which is provided with nonautomatic means to maintain the level of the contact liquid at a specified height, without being directly responsive to a sensed condition (e.g., weir, wall openings, tubes, gates, etc.).

**263 For portion of total gas flow:**

This subclass is indented under subclass 243. Apparatus which is provided with means for dividing the gaseous fluid mixture or the separated gaseous constituent into two or more flowing streams, so that less than all of the divided streams are brought into direct contact with the contact liquid in at least one phase of the separating operation.

**264 Utilizing a valve:**

This subclass is indented under subclass 263. Apparatus in which the means for dividing the gaseous fluid mixture or the separated gaseous constituent is a device which regulates the flow of the gaseous fluid mixture by opening, closing, or obstructing ports or passageways through which the gaseous fluid mixture flows.

**SEE OR SEARCH CLASS:**

251, Valves and Valve Actuation, appropriate subclasses for the specific structure of valves, per se.

**265 Including means to control contact liquid return flow to supply or sump:**

This subclass is indented under subclass 243. Apparatus having (1) manual or power operated means (e.g., pump, etc.) located at some point in a contact liquid recirculation system for recirculating at least a portion of the contact liquid back to the point of initial use, or (2) means to drain, control the flow of, or send back the contact liquid to a liquid bath or reservoir spaced apart from the contact zone.

- (1) Note. Mere mention of a recirculation line without positive recitation of control by pumping or restriction in the line is insufficient to cause a patent to be placed here.

**266 With heat exchange means:**

This subclass is indented under subclass 265. Apparatus including means to allow heat transfer between the gaseous fluid mixture or the separated gaseous constituent and the contact liquid or the gaseous fluid mixture or the separated gaseous constituent and some other fluid.

**267 Diverse means for adding liquid for gas and liquid contact:**

This subclass is indented under subclass 243. Apparatus having two or more unlike means which effect liquid contact with the gaseous fluid mixture or the separated gaseous constituent.

**268 Moving apparatus part for liquid contact:**

This subclass is indented under subclass 267. Apparatus in which one of the liquid contacting means is an apparatus part which moves to effect the contacting.

**269 And liquid bath or reservoir for contact:**

This subclass is indented under subclass 268. Apparatus in which one of the liquid contacting means is a container or receptacle holding a contact liquid having a liquid surface providing contact with the gaseous fluid mixture or the separated gaseous constituent either on top of or under the contact liquid surface.

**SEE OR SEARCH CLASS:**

261, Gas and Liquid Contact Apparatus, subclasses 119.1+ for a liquid tank providing either surface or subsurface liquid contact with a gas stream.

**270 And contact liquid sprayer:**

This subclass is indented under subclass 268. Apparatus in which one of the liquid contacting means provides contact liquid in a moving mass of dispersed droplets.

**SEE OR SEARCH CLASS:**

261, Gas and Liquid Contact Apparatus, subclasses 115+ for liquid spray contact with a gas stream.

**271 Means forming free-falling contact liquid curtain:**

This subclass is indented under subclass 267. Apparatus in which one of the liquid contacting means creates a moving liquid sheet that is



- extremely thin in relation to its length and breadth and that is not in contact with any surface during at least part of its travel in contact with the gaseous fluid mixture or the separated gaseous constituent.
- 272 Means forming flowing contact liquid film on apparatus surface:**  
This subclass is indented under subclass 267. Apparatus in which one of the liquid contacting means creates a moving liquid sheet that is extremely thin in relation to its length and breadth and that is in contact with a surface or wall in the apparatus during its travel in contact with the gaseous fluid mixture or the separated gaseous constituent.
- SEE OR SEARCH CLASS:  
261, Gas and Liquid Contact Apparatus, subclasses 112.1+ for liquid film contact with a gas stream.
- 273 And contact liquid sprayer:**  
This subclass is indented under subclass 272. Apparatus in which one of the liquid contacting means provides contact liquid in a moving mass of dispersed droplets.
- 274 Means to apply contact liquid to solid or porous sheet or tube:**  
This subclass is indented under subclass 267. Apparatus in which one of the liquid contacting means directs contact liquid on or against a solid or porous sheet or tube (e.g., the means either aids in liquid distribution or increases the gas and liquid contact surface area).
- SEE OR SEARCH CLASS:  
261, Gas and Liquid Contact Apparatus, subclasses 108+ for stationary baffles over which liquids flow in contact with gases.
- 275 Venturi passage:**  
This subclass is indented under subclass 274. Apparatus in which the tube has an inlet channel having a converging inlet portion terminating in a reduced throat portion and a diverging outlet portion extending from the throat.
- 276 And liquid bath or reservoir for contact:**  
This subclass is indented under subclass 274. Apparatus in which one of the liquid contacting means is a container or receptacle holding a liquid having a liquid surface providing contact with the gaseous fluid mixture or the separated gaseous constituent either on top of or under the liquid surface.
- 277 And contact liquid sprayer:**  
This subclass is indented under subclass 274. Apparatus in which one of the liquid contacting means provides contact liquid in a moving mass of dispersed droplets.
- 278 Liquid bath or reservoir for contact:**  
This subclass is indented under subclass 267. Apparatus in which one of the liquid contacting means is a container or receptacle holding a contact liquid having a liquid surface providing contact with the gaseous fluid mixture or the separated gaseous constituent either on top of or under the contact liquid surface.
- 279 Submerged inlet for subsurface contact:**  
This subclass is indented under subclass 278. Apparatus having an inlet for the gaseous fluid mixture or the separated gaseous constituent which extends below the surface of the liquid to effect subsurface contact of the gaseous fluid mixture or the separated gaseous constituent and the liquid.
- 280 And contact liquid sprayer:**  
This subclass is indented under subclass 278. Apparatus in which one of the liquid contacting or applying means provides contact liquid in a moving mass of dispersed droplets.
- 281 Movably mounted contact liquid distributor:**  
This subclass is indented under subclass 243. Apparatus having a continuously or intermittently moving liquid discharging means to cause the contact liquid to be put into the gaseous fluid mixture or the separated gaseous constituent.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
332, for a movable agitator in a liquid bath or reservoir for mixing a gas into the liquid bath or reservoir.
- 282 Rotatable solid disc or surface:**  
This subclass is indented under subclass 281. Apparatus in which the movably mounted liquid distributor is an imperforate, thin, flat plate



- or outer layer of a three-dimensional object that spins about an axis.
- 283 Partially immersed within contact liquid:**  
This subclass is indented under subclass 282. Apparatus in which the rotatable solid disc or surface is submerged, but not completely, in the contact liquid.
- 284 Rotation causes contact liquid to be drawn from liquid reservoir (e.g., suction, etc.):**  
This subclass is indented under subclass 282. Apparatus which has means by which movement of the movably mounted liquid distributor causes the contact liquid to be removed (e.g., pulled, sucked, etc.) from a liquid supply and contacted with the gaseous fluid mixture or the separated gaseous constituent.
- 285 Rotation caused by flowing contact liquid or gas:**  
This subclass is indented under subclass 282. Apparatus which has means for causing flowing contact liquid or flowing gaseous fluid mixture or flowing separated gaseous constituent to rotate the movably mounted liquid distributor.
- 286 Rotatable porous disc or surface:**  
This subclass is indented under subclass 281. Apparatus in which the movably mounted liquid distributor is a perforate, thin, flat plate or outer surface layer of a three-dimensional object that spins about an axis.
- 287 Partially immersed within contact liquid:**  
This subclass is indented under subclass 286. Apparatus in which the rotatable porous disc or surface is submerged, but not completely, in the contact liquid.
- 288 Belt type:**  
This subclass is indented under subclass 287. Apparatus in which the rotatable porous surface is a continuous band or endless surface.
- 289 Drum type:**  
This subclass is indented under subclass 287. Apparatus in which the rotatable porous surface has a cylindrical shape.
- 290 Particulate media, shaped packing elements (e.g., Raschig rings, Berl saddles, etc.), or porous media for gas and liquid contact:**  
This subclass is indented under subclass 243. Apparatus having means to apply the contact liquid to a contact means comprised of (a) a plurality of small, discrete solids permitting flow of the gaseous fluid mixture or the separated gaseous constituent through interstices formed between the solids (e.g., particulate bed, etc.), (b) a mass of randomly oriented or positioned elements which may be molded, machined, or formed, that possess specific advantages of surface availability for contacting the contact liquid and the gaseous fluid mixture or the separated gaseous constituent (e.g., Raschig rings, Berl saddles, Intalox saddles, Pall rings, etc.), or (c) a mass having pores therein providing interstices and thereby surface extending paths therein for liquid contact with the gaseous fluid mixture or the separated gaseous constituent passing therethrough.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
322, for means for forming flowing liquid film on apparatus surface or free-falling liquid curtain for gas and liquid contact.
- SEE OR SEARCH CLASS:  
95, Gas Separation: Apparatus, subclasses 210+ for processes involving gas and liquid contact on a surface extending mass.  
261, Gas and Liquid Contact Apparatus, subclasses 94+ and Digest 72 for similar media or elements wherein gas and liquid are mixed, and wherein a constituent may be separated from the gas.
- 291 Moving:**  
This subclass is indented under subclass 290. Apparatus having means to put the contact means in motion during use or wherein the contact means is moved about by a fluid.
- 292 In engine air inlet:**  
This subclass is indented under subclass 290. Apparatus wherein the contact means is located in the air supply line for an engine.



**293 In fuel dispersal means (e.g., in carburetor, etc.):**

This subclass is indented under subclass 290. Apparatus wherein the contact means is located in or consists of means to mix fuel into an air stream.

**294 Humidifier or evaporative cooler:**

This subclass is indented under subclass 290. Apparatus wherein the contact means distributes water into the gaseous fluid mixture or the separated gaseous constituent to increase the amount of water or water vapor in the gaseous fluid mixture or the separated gaseous constituent or to lower the temperature of the gaseous fluid mixture or the separated gaseous constituent.

**295 Gas dehydrator (e.g., glycol type, etc.):**

This subclass is indented under subclass 290. Apparatus wherein the contact means causes gas and liquid contact whereby the contact liquid absorbs water from the gaseous fluid mixture or the separated gaseous constituent.

**296 Mesh or fabric screen, fibrous or filamentary pad, or perforated plate:**

This subclass is indented under subclass 290. Apparatus wherein the contact means consists of a filter with an open network of interlacing threads or wires; a porous mass made of slender, elongated material or of fine or thinly spun threads or wires; or a flat, thin, inflexible body of uniform thickness having holes there-through.

**297 By sprayer:**

This subclass is indented under subclass 296. Apparatus wherein a moving mass of dispersed droplets is applied to the contact means.

**298 Foam:**

This subclass is indented under subclass 290. Apparatus wherein the contact means has a rigid or semi-rigid cellular structure (e.g., sponge rubber, etc.).

**299 Parallel plate, sheet, or member:**

This subclass is indented under subclass 290. Apparatus wherein the contact means comprises elements spaced an equal distance apart.

**300 Downstream gas separation means (e.g., mist eliminator, etc.):**

This subclass is indented under subclass 290. Apparatus in which a gas separation means is located after the gas and liquid contact apparatus.

**301 Fixed gas whirler or rotator for gas separation:**

This subclass is indented under subclass 243. Apparatus comprising a chamber or static flow guide for causing the gaseous fluid mixture to spin about an axis in order to cause gas separation.

**SEE OR SEARCH CLASS:**

55, Gas Separation, subclasses 447+ for fixed gas whirler or rotator means, per se, for gas separation without liquid contact means.

261, Gas and Liquid Contact Apparatus, subclasses 79.1+ for means producing a whirling gas flow in an apparatus for contacting gas and liquid.

**302 Having conical baffle with apex facing upstream:**

This subclass is indented under subclass 301. Apparatus in which the static flow guide has circular cross sections of increasing diameter with the smallest diameter section facing upstream.

**SEE OR SEARCH CLASS:**

55, Gas Separation, subclass 463 for a conical baffle with an apex facing upstream in a gas separation apparatus without liquid contact means.

**303 Contact liquid applied in central gaseous flow path of concentric gaseous flow paths:**

This subclass is indented under subclass 301. Apparatus having means defining gaseous flow paths arranged so that a path flows about or surrounds an innermost axial path and having means to distribute contact liquid in the innermost flow path.

**304 Baffle, vane, or plate in outer gaseous flow path:**

This subclass is indented under subclass 303. Apparatus having a surface positioned in a surrounding gaseous flow path to redirect the



direction of or to alter the velocity of the flow path.

**305 Baffle, vane, or plate in central gaseous flow path:**

This subclass is indented under subclass 303. Apparatus having a surface positioned in the innermost axial gaseous flow path to redirect the direction of or to alter the velocity of the flow path.

**306 Liquid contact preceding whirler or rotator:**

This subclass is indented under subclass 301. Apparatus having liquid distributing means arranged to supply contact liquid upstream of the whirler or rotator.

**307 Means forming free-falling contact liquid curtain:**

This subclass is indented under subclass 306. Apparatus in which the liquid distributing means creates a moving liquid sheet that is extremely thin in relation to its length and breadth and that is not in contact with any surface during at least part of its travel in contact with the gaseous fluid mixture.

SEE OR SEARCH THIS CLASS, SUBCLASS:

322, for gas separation apparatus having means forming a free-falling liquid curtain other than a fixed gas whirler or rotator combined with means forming a free-falling liquid curtain for gas and liquid contact.

**308 Means forming flowing contact liquid film on apparatus surface:**

This subclass is indented under subclass 306. Apparatus in which the liquid distributing means creates a moving liquid sheet that is extremely thin in relation to its length and breadth and that is in contact with a surface or wall in the apparatus during its travel in contact with the gaseous fluid mixture.

SEE OR SEARCH THIS CLASS, SUBCLASS:

322, for gas separation apparatus having means forming a flowing liquid film on an apparatus surface for gas and liquid contact not including a fixed gas whirler or rotator for gas separation.

SEE OR SEARCH CLASS:

261, Gas and Liquid Contact Apparatus, subclasses 112.1+ for liquid film contact with a gas stream.

**309 Liquid bath or reservoir for contact:**

This subclass is indented under subclass 306. Apparatus in which the liquid distributing means is a container or receptacle holding a contact liquid having a liquid surface providing contact with the gaseous fluid mixture either on top of or under the contact liquid surface.

SEE OR SEARCH THIS CLASS, SUBCLASS:

329, for gas separation apparatus having a liquid bath or reservoir for gas and liquid contact not including a fixed gas whirler or rotator for gas separation.

SEE OR SEARCH CLASS:

261, Gas and Liquid Contact Apparatus, subclasses 119.1+ for gas contact with a liquid bath or reservoir.

**310 And downstream filter:**

This subclass is indented under subclass 309. Apparatus having a foraminous or porous mass which separates solid or liquid particles from the gaseous fluid mixture or the separated gaseous constituent by entrapment and retention while permitting gaseous or vaporous constituents to pass through located after the liquid bath or reservoir.

**311 Contact liquid spray:**

This subclass is indented under subclass 306. Apparatus in which the liquid distributing means provides contact liquid in a moving mass of dispersed droplets.

SEE OR SEARCH CLASS:

261, Gas and Liquid Contact Apparatus, subclasses 115+ for liquid spray contact with a gas stream.

**312 Within a venturi passage:**

This subclass is indented under subclass 311. Apparatus in which the contact liquid spray is provided in an area having an inlet channel having a converging inlet portion terminating in a reduced throat portion and a diverging out-



let portion extending from the throat by means of which liquid and gas are drawn through the area.

- 313 Tangential gas inlet into whirler or rotator:**  
This subclass is indented under subclass 311. Apparatus having an inflow gas conductor which directs the gaseous fluid mixture or the separated gaseous constituent into the chamber containing the whirler or rotator in a path other than one which intersects or is parallel to the longitudinal axis of the chamber.

- 314 Liquid contact within whirler or rotator:**  
This subclass is indented under subclass 301. Apparatus having liquid distributing means arranged to supply contact liquid within the whirler or rotator.

- 315 Means forming free-falling contact liquid curtain:**  
This subclass is indented under subclass 314. Apparatus in which the liquid distributing means creates a moving liquid sheet that is extremely thin in relation to its length and breadth and that is not in contact with any surface during at least part of its travel in contact with the gaseous fluid mixture or the separated gaseous constituent.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 322, for gas separation apparatus having means forming a free-falling liquid curtain not including a fixed gas whirler or rotator.

- 316 Means forming flowing contact liquid film on apparatus surface:**  
This subclass is indented under subclass 314. Apparatus in which the liquid distributing means creates a moving liquid sheet that is extremely thin in relation to its length and breadth and that is in contact with a surface or wall in the apparatus during its travel in contact with the gaseous fluid mixture or the separated gaseous constituent.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 322, for gas separation apparatus having means forming a flowing liquid film on an apparatus surface not including

a fixed gas whirler or rotator for gas separation.

SEE OR SEARCH CLASS:

- 261, Gas and Liquid Contact Apparatus, subclasses 112.1+ for liquid film contact with a gas stream.

- 317 Liquid bath or reservoir for contact:**  
This subclass is indented under subclass 314. Apparatus in which the liquid distributing means is a container or receptacle holding a contact liquid having a liquid surface providing contact with the gaseous fluid mixture or the separated gaseous constituent either on top of or under the contact liquid surface.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

- 329, for gas separation apparatus having a liquid bath or reservoir not including a fixed gas whirler or rotator for gas separation.

SEE OR SEARCH CLASS:

- 261, Gas and Liquid Contact Apparatus, subclasses 119.1+ for gas contact with a liquid bath or reservoir.

- 318 And downstream filter:**  
This subclass is indented under subclass 317. Apparatus having a foraminous or porous mass which separates solid or liquid particles from the gaseous fluid mixture or the separated gaseous constituent by entrapment and retention while permitting gaseous or vaporous constituents to pass through located after the liquid bath or reservoir.

- 319 Contact liquid spray:**  
This subclass is indented under subclass 314. Apparatus in which the liquid distributing means provides contact liquid in a moving mass of dispersed droplets.

- 320 Baffle means for producing or aiding contact liquid spray formation:**  
This subclass is indented under subclass 319. Apparatus in which a surface is provided in a contact liquid flow path to be contacted by the contact liquid for redirecting or altering the contact liquid flow path to create or further assist liquid spray creation.



- 321 Having tangential gaseous fluid mixture inlet:**  
This subclass is indented under subclass 301. Apparatus in which the gaseous fluid mixture enters the chamber containing the whirler or rotator through an inflow gas conductor which directs the gaseous fluid mixture into the chamber in a path other than one which intersects or is parallel to the longitudinal axis of the chamber.
- 322 Means forming flowing contact liquid film on apparatus surface or free-falling contact liquid curtain for gas and liquid contact:**  
This subclass is indented under subclass 243. Apparatus in which the gas and liquid contact means creates a moving liquid sheet that is extremely thin in relation to its length and breadth and that is in contact with a surface or wall in the apparatus during its travel in contact with the gaseous fluid mixture or the separated gaseous constituent or the gas and liquid contact means creates a moving liquid sheet that is extremely thin in relation to its length and breadth and that is not in contact with any surface during at least part of its travel in contact with the gaseous fluid mixture or the separated gaseous constituent.
- SEE OR SEARCH CLASS:  
95, Gas Separation: Processes, subclass 217 for processes of gas separation wherein a liquid curtain is employed.  
261, Gas and Liquid Contact Apparatus, subclasses 112.1+ for apparatus wherein liquids are directed over baffles in a thin layer or film.  
454, Ventilation, subclasses 54+ for paint spray booths employing liquid films or curtains for paint droplet removal.
- 323 Venturi type:**  
This subclass is indented under subclass 322. Apparatus wherein the moving liquid sheet is located in an inlet channel having a converging inlet portion terminating in a reduced throat portion and a diverging outlet portion extending from the throat.
- 324 Curved impingement surface:**  
This subclass is indented under subclass 322. Apparatus having a rounded surface on which the moving liquid sheet flows and against which the gaseous fluid mixture or the separated gaseous constituent flows.
- 325 Impingement baffle or pan:**  
This subclass is indented under subclass 322. Apparatus having a surface on which the liquid sheet flows and that redirects or alters the flow of a fluid or having a shallow reservoir in which the liquid sheet flows and against which the gaseous fluid mixture or the separated gaseous constituent flows.
- 326 Liquid flow surface perforated for gas flow therethrough:**  
This subclass is indented under subclass 322. Apparatus which has a surface, on which the liquid sheet flows, that has holes through which the gaseous fluid mixture or the separated gaseous constituent passes.
- 327 Imperforate film supporting surface:**  
This subclass is indented under subclass 322. Apparatus which has a solid surface that does not have any holes therethrough on which the liquid sheet flows.
- 328 Inclined:**  
This subclass is indented under subclass 327. Apparatus wherein the solid surface is mounted in a nonhorizontal, nonvertical position.
- 329 Liquid bath or reservoir for contact:**  
This subclass is indented under subclass 243. Apparatus in which the gas and liquid contact means is a container or receptacle holding a contact liquid having a liquid surface providing contact with the gaseous fluid mixture or the separated gaseous constituent either on top of or under the contact liquid surface.
- SEE OR SEARCH CLASS:  
261, Gas and Liquid Contact Apparatus, subclasses 83+ and 119.1+ for liquid tanks for gas and liquid contact.
- 330 Having back pressure relief or liquid blow-back trap or separator:**  
This subclass is indented under subclass 329. Apparatus having a gas escape means so arranged as to relieve excessive outlet pressure or to prevent gas reverse flow in the direction of the reservoir; or a supplemental liquid chamber or a liquid separating, directing, or retaining means to separate, accept, or channel liquid



displaced from the reservoir by reverse flow of the outgoing gas.

**331 Having antispash means or means for retaining contact liquid during upset or tilt:**

This subclass is indented under subclass 329. Apparatus having means for maintaining the contact liquid at or near the surface of the bath in a relatively quiescent state or having means which prevent the contact liquid of the bath from escaping during other than normal attitudes of the apparatus.

**332 With movable agitator in bath or reservoir for commingling gas and liquid:**

This subclass is indented under subclass 329. Apparatus having means retained or mounted for movement in the bath or reservoir, the movement of which increases the contact relationship of the gaseous fluid mixture or the separated gaseous constituent with the liquid in the bath or reservoir.

SEE OR SEARCH THIS CLASS, SUBCLASS:

281+, for a movably mounted liquid distributor that discharges or applies the contact liquid into the gaseous fluid mixture or the separated gaseous constituent.

SEE OR SEARCH CLASS:

261, Gas and Liquid Contact Apparatus, subclasses 83+ for rotating gas and liquid contact apparatus.

**333 Nonliquid gas separator positioned above liquid bath or reservoir:**

This subclass is indented under subclass 329. Apparatus having a gas separator of nonliquid form arranged over the bath or reservoir in a normal use attitude.

SEE OR SEARCH THIS CLASS, SUBCLASS:

265, for apparatus to control the flow of separated liquid to the liquid supply or sump.

**334 Having means for forming contact liquid into spray or heap:**

This subclass is indented under subclass 333. Apparatus having gas conducting means arranged to cause distortion of the surface of

the bath or reservoir into a moving mass of dispersed droplets or a lifting up of the surface of the bath or reservoir.

SEE OR SEARCH CLASS:

261, Gas and Liquid Contact Apparatus, subclasses 91+ for apparatus wherein a rotating agitator penetrates the liquid surface.

**335 Central downward gas inlet:**

This subclass is indented under subclass 334. Apparatus having a gas inlet in a middle location in which the gaseous fluid mixture or the separated gaseous constituent flows from a higher to a lower level.

**336 Gas flows tangentially to liquid surface:**

This subclass is indented under subclass 334. Apparatus wherein the gas conducting means causes the gaseous fluid mixture or the separated gaseous constituent to flow tangentially to the contact liquid surface to effect contact with the liquid.

**337 Superposed filter:**

This subclass is indented under subclass 333. Apparatus wherein the separator positioned above the liquid bath is a foraminous or porous mass which separates solid or liquid particles from the gaseous fluid mixture or the separated gaseous constituent by entrapment and retention while permitting gaseous or vaporous constituents to pass through.

**338 Having flow guide preventing entire filter face contact by gas flow:**

This subclass is indented under subclass 337. Apparatus having a gas flow directing or blocking means adjacent a portion of the upstream face of the filter to thereby restrict or limit the area of the filter face exposed to the flow of the gaseous fluid mixture or the separated gaseous constituent.

(1) Note. The usual purpose of this feature is to provide a liquid return path through the filter out of contact with the gas passing therethrough.



**339 Surrounding gas flow path:**

This subclass is indented under subclass 337. Apparatus in which the filter is of annular configuration and is coaxial with a gas passage at its center.

**SEE OR SEARCH CLASS:**

261, Gas and Liquid Contact Apparatus, subclasses 121.1+ for apparatus wherein a gas enters a liquid body at a submerged location.

**340 Submerged inlet for subsurface contact:**

This subclass is indented under subclass 339. Apparatus having an inlet for the gaseous fluid mixture or the separated gaseous constituent which extends below the surface of the contact liquid to effect subsurface contact of the gaseous fluid mixture or the separated gaseous constituent and the contact liquid.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

342+, for similar apparatus wherein a filter does not surround the gas flow path and subclasses 351+ for similar apparatus which does not include a superposed filter.

**SEE OR SEARCH CLASS:**

261, Gas and Liquid Contact Apparatus, subclasses 121.1+ for apparatus wherein a gas enters a liquid body at a submerged location.

**341 And separable liquid sump:**

This subclass is indented under subclass 340. Apparatus comprising a removable liquid retaining receptacle situated to receive gravity flow of the liquid from the filter.

**342 Submerged inlet for subsurface contact:**

This subclass is indented under subclass 337. Apparatus having an inlet for the gaseous fluid mixture or the separated gaseous constituent which extends below the surface of the contact liquid to effect subsurface contact of the gaseous fluid mixture or the separated gaseous constituent and the contact liquid.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

340+, for similar apparatus having a superposed filter which surrounds the gas flow path or subclasses 351+ for similar apparatus without a separator positioned above the liquid bath.

**343 Multiple outlet orifices in submerged inlet:**

This subclass is indented under subclass 342. Apparatus wherein the inlet has a plurality of outlet holes through which the gaseous fluid mixture or the separated gaseous constituent enters below the contact liquid surface.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

352+, for similar apparatus without a superposed filter.

**SEE OR SEARCH CLASS:**

261, Gas and Liquid Contact Apparatus, subclasses 121.1+ (see particularly subclass 124) for apparatus wherein a gas enters a liquid body at a submerged location through multiple orifices.

**344 Perforated pipe:**

This subclass is indented under subclass 343. Apparatus wherein the inlet is a submerged hollow cylinder having holes through which the gaseous fluid mixture or the separated gaseous constituent enters.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

353, for similar apparatus without a superposed filter.

**345 Perforated plate:**

This subclass is indented under subclass 343. Apparatus wherein the inlet is a submerged flat, thin, inflexible body of uniform thickness having holes through which the gaseous fluid mixture or the separated gaseous constituent enters.

**SEE OR SEARCH THIS CLASS, SUB-CLASS:**

354, for similar apparatus without a superposed filter.



**346 Submerged baffle:**

This subclass is indented under subclass 342. Apparatus having a submerged surface against which the gaseous fluid mixture or the separated gaseous constituent flows in order to redirect or alter the gaseous fluid mixture or the separated gaseous constituent flow path to effect mixing with the contact liquid.

**SEE OR SEARCH CLASS:**

261, Gas and Liquid Contact Apparatus, subclass 123 for similar apparatus wherein gas flows against a submerged baffle.

**347 Gas flows tangentially to liquid surface:**

This subclass is indented under subclass 337. Apparatus wherein a gas-conducting means causes the gaseous fluid mixture or the separated gaseous constituent to flow tangentially to the contact liquid surface to effect contact with the liquid.

**SEE OR SEARCH CLASS:**

261, Gas and Liquid Contact Apparatus, subclasses 119.1+ for similar apparatus wherein gas flows against a liquid surface to effect contact with the liquid.

**348 Superposed stationary deflector:**

This subclass is indented under subclass 333. Apparatus wherein the separator positioned above the liquid bath is a nonmoving surface which effects a change in direction of flow of the gaseous fluid mixture or the separated gaseous constituent or guides the flow of the gaseous fluid mixture or the separated gaseous constituent causing the heavier constituents therein to drop out while the lighter constituents flow on.

**349 Flow reversal:**

This subclass is indented under subclass 348. Apparatus wherein the stationary deflector turns the direction of flow of the gaseous fluid mixture or the separated gaseous constituent in the opposite direction.

**350 Tortuous path:**

This subclass is indented under subclass 348. Apparatus wherein the stationary deflector forms a path for the gaseous fluid mixture or

the separated gaseous constituent that is repeatedly turned or bent.

**351 Submerged inlet for subsurface contact:**

This subclass is indented under subclass 329. Apparatus having an inlet for the gaseous fluid mixture or the separated gaseous constituent which extends below the surface of the contact liquid to effect subsurface contact of the gaseous fluid mixture or the separated gaseous constituent and the contact liquid.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

340+, for similar apparatus having a superposed filter surrounding the gas flow path and subclasses 342+ for similar apparatus including a superposed filter of other than annular configuration.

**SEE OR SEARCH CLASS:**

261, Gas and Liquid Contact Apparatus, subclasses 121.1+ for apparatus wherein a gas enters a liquid body at a submerged location.

**352 Multiple outlet orifices in submerged inlet:**

This subclass is indented under subclass 351. Apparatus wherein the inlet has a plurality of outlet holes through which the gaseous fluid mixture or the separated gaseous constituent enters below the contact liquid surface.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

343, for similar apparatus including a superposed filter.

**SEE OR SEARCH CLASS:**

261, Gas and Liquid Contact Apparatus, subclasses 121.1+ (see, particularly subclass 124) for apparatus wherein gas enters a liquid body at a submerged location through multiple orifices.

**353 Perforated pipe:**

This subclass is indented under subclass 352. Apparatus wherein the inlet is a submerged hollow cylinder having holes through which the gaseous fluid mixture or the separated gaseous constituent enters.



SEE OR SEARCH THIS CLASS, SUB-CLASS:

344, for similar apparatus with a superposed filter.

**354 Perforated plate:**

This subclass is indented under subclass 352. Apparatus wherein the inlet is a submerged flat, thin, inflexible body of uniform thickness having holes through which the gaseous fluid mixture or the separated gaseous constituent enters.

SEE OR SEARCH THIS CLASS, SUB-CLASS:

345, for similar apparatus with a superposed filter.

**355 Nonliquid gas separating means downstream of liquid contact means:**

This subclass is indented under subclass 243. Apparatus having nonliquid means to separate the gaseous fluid mixture or a separated gaseous constituent located beyond the liquid contact means in the direction of gas flow.

**356 Parallel vanes or baffles:**

This subclass is indented under subclass 355. Apparatus in which the nonliquid means is formed either of at least two slanted plates that are an equal distance apart at every point between which the gaseous fluid mixture or the separated gaseous constituent flows (e.g., louver, etc.) that are constructed to provide substantially constant area for flow of the gaseous fluid mixture or the separated gaseous constituent or of at least two plates that are an equal distance apart at every point between which the gaseous fluid mixture or the separated gaseous constituent flows in a tortuous or sinuous path, the plates being bent, deformed, or provided with projections, and arranged relatively one to the other so that a bend, deformation, or projection of one plate is spaced from the corresponding bend, deformation, or projection of the other, so as to provide substantially constant area for the flow of the gaseous fluid mixture or the separated gaseous constituent.

**357 And diverse separating means:**

This subclass is indented under subclass 356. Apparatus which includes other nonliquid means to separate the gaseous fluid mixture or

the separated gaseous constituent (e.g., filters, centrifugal separator, etc.).

**358 Overlapping vanes or baffles:**

This subclass is indented under subclass 355. Apparatus in which the nonliquid means comprises a plurality of surfaces which effect an abrupt change in direction of the gaseous fluid mixture or the separated gaseous constituent flow or guides the flow to cause the heavier constituents therein to drop out and remain behind, while lighter constituents (e.g., clean gas, etc.) flow on, with at least a portion of each surface being superposed with respect to the next adjacent surface in the direction of gaseous fluid mixture or the separated gaseous constituent flow.

**359 Moving centrifugal separator:**

This subclass is indented under subclass 355. Apparatus in which the nonliquid means comprises a nonstatic member designed to cause the gaseous fluid mixture or the separated gaseous constituent to rotate or spin around an axis.

**360 Impact vane, baffle, or wall:**

This subclass is indented under subclass 355. Apparatus in which the nonliquid means comprises a surface in the flow path of the gaseous fluid mixture or the separated gaseous constituent to be impinged upon by the gaseous fluid mixture or the separated gaseous constituent for redirecting or altering the flow path for separation of nongaseous constituents therefrom.

**361 Filter:**

This subclass is indented under subclass 355. Apparatus in which the nonliquid means comprises a foraminous or porous mass in which a gas and solid or liquid particles entrained therein are passed through the foraminous or porous mass which separates the solid or liquid particles from the gas by entrapment and retention while permitting the gaseous or vaporous constituents to pass through.

**362 Perforated plate:**

This subclass is indented under subclass 361. Apparatus in which the filter is a flat, thin, inflexible body of uniform thickness having holes therethrough and is positioned transverse to the flow path of the gaseous fluid mixture or the separated gaseous constituent.



**363 Mesh or fabric screen:**

This subclass is indented under subclass 361. Apparatus in which the filter is an open network of interlacing threads or wires and is positioned transverse to the flow path of the gaseous fluid mixture or the separated gaseous constituent.

**364 Fibrous or filamentary pad:**

This subclass is indented under subclass 361. Apparatus in which the filter is a porous mass of slender, elongated material of fine or thinly spun threads or wires.

**365 And preliminary separating means:**

This subclass is indented under subclass 355. Apparatus which has a nonliquid gas separating means arranged before the liquid contacting means.

**366 Deflector upstream of liquid contact means:**

This subclass is indented under subclass 243. Apparatus having a surface located before the liquid contact means which effects a change in direction of the gaseous fluid mixture or guides the gaseous fluid mixture causing the heavier constituents therein to drop out while the lighter constituents flow on.

**SEE OR SEARCH CLASS:**

55, Gas Separation, subclasses 434+ for a deflector, per se, in a gas separation apparatus without liquid contact means.

**367 Imperforate, impermeable baffle:**

This subclass is indented under subclass 366. Apparatus in which the deflector is a solid surface that does not have any holes therethrough.

**368 Conical:**

This subclass is indented under subclass 367. Apparatus in which the baffle has circular cross sections of increasing diameter.

**369 Ribbed or corrugated:**

This subclass is indented under subclass 367. Apparatus in which the baffle has raised ridges or parallel and alternating ridges and grooves on or in its surface.

**370 Angled or inclined:**

This subclass is indented under subclass 367. Apparatus in which the baffle is mounted in a nonhorizontal, nonvertical position.

**371 Filter upstream of liquid contact means:**

This subclass is indented under subclass 243. Apparatus having means before the liquid contact means in which a gas and solid or liquid particles entrained therein are passed through a foraminous or porous mass which separates the solid or liquid particles from the gas by entrapment and retention while permitting the gaseous or vaporous constituents to pass through.

**372 INCLUDING INLET MEANS FOR DIVERSE GAS OR SOLID FOR GAS TREATMENT:**

This subclass is indented under the class definition. Apparatus providing inflow means for a nonliquid material other than a gaseous fluid mixture that is to be separated, the nonliquid material commingling or mixing with and effecting a change of the gaseous fluid mixture, but not including inflow of ambient air for purposes of pressure relief or addition of air for mere flow induction of the gaseous fluid mixture.

- (1) Note. Steam used for the purpose of induction flow of the gaseous fluid mixture is regarded as a nonliquid material under this definition.
- (2) Note. If a treated gaseous fluid mixture is discharged into an enclosure (e.g., room, etc.) and then a portion thereof enters the apparatus through a recirculation inlet to be mixed with the gaseous fluid mixture entering through the normal inlet, the portion is considered as a nonliquid material other than gaseous fluid mixture under this definition.

**373 Solid or vaporized solid:**

This subclass is indented under subclass 372. Apparatus in which a solid or a gas derived from a normally solid source is the nonliquid material introduced into the gaseous fluid mixture.

- (1) Note. A normal solid is one which at ordinary temperatures and pressures is in



the solid state. Solid carbon dioxide and other solidified normally gaseous or liquid materials do not qualify under this definition.

**374 Steam is diverse gas:**

This subclass is indented under subclass 372. Apparatus using vaporized water as the nonliquid material.

**SEE OR SEARCH CLASS:**

261, Gas and Liquid Contact Apparatus, Digest 76 for apparatus wherein steam is introduced into gas for various purposes (e.g., to humidify air or to separate particles from air or from combustion products, etc.).

**375 Added into combustion products:**

This subclass is indented under subclass 374. Apparatus wherein the steam is introduced into a gaseous fluid mixture that was produced by a process of burning.

**376 To effect particle removal (e.g., dust removal, etc.):**

This subclass is indented under subclass 374. Apparatus wherein the steam is introduced to take away very small solids from the gaseous fluid mixture.

**377 And outlet for condensed vapors:**

This subclass is indented under subclass 372. Apparatus provided with a discharge port for liquids or solids formed by temperature reduction resulting from the mixing of the gaseous fluid mixture and the nonliquid material.

**378 Downstream of separator:**

This subclass is indented under subclass 372. Apparatus in which the inflow means is positioned to add the nonliquid material to a separated gaseous constituent after the gaseous fluid mixture has been separated in at least one stage.

**379 And gas regulation for each inflowing gas:**

This subclass is indented under subclass 372. Apparatus in which the nonliquid material is a gas and may enter through an inflow line for the gaseous fluid mixture or through a distinct inflow line, and in which (1) there is a single flow controller located in the common inflow line to regulate the proportion or mixture of the

diverse gases or (2) controllers individual to each inflow line are provided for the regulation.

**380 WITH SOUND DAMPING MEANS (I.E., NOISE ATTENUATION):**

This subclass is indented under the class definition. Apparatus having means other than mere flow channels or conducting means for a gaseous fluid mixture for silencing flow of the gaseous fluid mixture as by sound traps or barriers, flow path configuration, or by selection of materials for the apparatus or flow conducting means having sound absorbing properties.

**SEE OR SEARCH CLASS:**

181, Acoustics, subclasses 175+ for sound modifying devices.

**381 Sound absorbing material:**

This subclass is indented under subclass 380. Apparatus having sound damping means or flow channel surfaces made with material having noise attenuation properties in order to reduce noise.

**382 For vacuum cleaner:**

This subclass is indented under subclass 381. Apparatus having sound damping means for a cleaning device through which the gaseous fluid mixture passes under reduced pressure.

**383 For internal combustion engine:**

This subclass is indented under subclass 381. Apparatus having sound damping means for an internal combustion engine in which the gaseous fluid mixture is used for ignition of fuel.

**384 Sound attenuating gas flow path:**

This subclass is indented under subclass 380. Apparatus having means to change direction of the gaseous fluid mixture in order to achieve silencing of the flow of the gaseous fluid mixture.

**385 Baffle in flow path:**

This subclass is indented under subclass 384. Apparatus in which a surface in the flow path of the gaseous fluid mixture redirects or alters the flow path of the gaseous fluid mixture in order to achieve noise suppression.



**386 For internal combustion engine:**

This subclass is indented under subclass 385. Apparatus having sound damping means for an internal combustion engine in which the gaseous fluid mixture is used for ignition of fuel.

**387 Perforated surface:**

This subclass is indented under subclass 384. Apparatus having means for passage of the gaseous fluid mixture through holes in a wall along the gaseous fluid mixture flow path in order to achieve silencing of the flow of the gaseous fluid mixture.

**388 Expansion chamber:**

This subclass is indented under subclass 384. Apparatus in which the gaseous fluid mixture flow path contains an enlargement of cross-sectional flow area.

**389 SONIC MEANS (I.E., USING SOUND WAVES):**

This subclass is indented under the class definition. Apparatus having means for producing compressional vibratory wave energy in a gaseous fluid mixture to effect or enhance separation, the waves being below, within, or beyond the audible spectrum.

- (1) Note. Pressure pulses in a gaseous fluid mixture generated merely by intermittent discharge of a gas are not considered to be compressional vibratory waves under this definition. However, compressional vibratory waves under this definition may be produced by intermittent discharge of a gas, as in a siren.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

- 175, for degasifying means for liquid using sound waves.

**SEE OR SEARCH CLASS:**

- 55, Gas Separation, subclass 292 for devices utilizing sound waves for cleaning separating media.  
95, Gas Separation: Processes, subclasses 29+ for processes of gas separation in which sound waves are used.

**390 SHELF OR EDGE TYPE:**

This subclass is indented under the class definition. Apparatus having (1) particle separating flow passages resulting from closely spaced parallel (or almost parallel) or concentrically arranged members along the faces of which a gas and solid or liquid particles entrained therein is constrained to pass without reliance upon change of direction for separation but which provide either (a) a screen or grid-like pattern at the inflow end of the arrangement or (b) surfaces on which solid or liquid particles may settle or drop; or (2) a surface with somewhat exaggerated nap-like or pile-like covering along which a gas and solid or liquid particles entrained therein moves such that in effect the particles are swept out of the gas.

- (1) Note. The shelf-like member must have sufficient space above it for movement of the gas so that not all of the gas is constrained to pass through the interstices formed by the nap or pile.  
(2) Note. None of the patents in these subclasses have flow through the filter, but flow of the gas is along the surface of the filter material or parallel elements.

**SEE OR SEARCH CLASS:**

- 55, Gas Separation, subclass 440 for parallel nonplanar plates which cause gas to flow in a tortuous or sinuous path for separation and subclass 477 for filter media of strand or bristle type, having unsupported or free extremities, through which gas passes.

**391 Helical or spiral wound strip:**

This subclass is indented under subclass 390. Apparatus in which the member is a flat strip coiled about a central core in such a manner as to generate turns about the axis of the central core with each turn spaced along the axis from the previous turn and so that the flat faces of the member are perpendicular to the axis of the core.

**392 Parallel plates or discs:**

This subclass is indented under subclass 390. Apparatus in which the members are at least two flat, thin, rigid bodies of uniform thickness that are an equal distance apart at every point.



**393 Grooved or slotted:**

This subclass is indented under subclass 392. Apparatus in which surfaces of the parallel plates or discs have long, narrow furrows or channels.

**394 Having fibrous filter material or porous structure:**

This subclass is indented under subclass 392. Apparatus in which the parallel plates or discs have a porous mass made of slender, elongated material or a mass having pores therein providing interstices in order to trap the particles from the gas flowing over the surface of the plates or discs.

**395 Nap-like or pile-like material:**

This subclass is indented under subclass 390. Apparatus in which the surface is fuzzy or has cut or uncut loops of twisted threads.

**396 WITH DRIP OR ESCAPING MATERIAL, OTHER THAN SEPARATED CONSTITUENT, COLLECTOR:**

This subclass is indented under the class definition. Apparatus having means to catch or otherwise dispose of material separated from a gaseous fluid mixture that drips, leaks, or otherwise is lost through parts of the apparatus other than the discharge outlets specifically provided for the constituents of the gaseous fluid mixture.

- (1) Note. The drip could be a liquid escaping through a seal or a viscous material running off or escaping to the exterior of the apparatus, but not to a reservoir or sump specifically provided for redistributing the liquid or material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 234+, for gas and liquid contact apparatus for gas separation including means to regenerate, purify, or separate the contact liquid.  
243+, for gas separation apparatus combined with gas and liquid contact apparatus.

**397 WITH CONTROL MEANS RESPONSIVE TO SENSED CONDITION FOR CON-****TROL OF GAS FLOW OR NONGAS-  
EOUS CONSTITUENT DISCHARGE:**

This subclass is indented under the class definition. Apparatus having means to sense a condition which may or may not occur, or a change in such condition or a lack of such a condition or the result of such a condition, the sensing means causing or permitting operation of a separate means for controlling, without the intervention of a human attendant, means to (1) regulate (e.g., divert, halt, or commence, etc.) the flow of a gaseous fluid mixture through the apparatus or part thereof or (2) regulate the movement from the apparatus of an accumulated separated constituent exclusive of that which may be retained in or on the separating media itself.

- (1) Note. Time is not considered a "condition" in this definition. For separators with timing means see subclasses 424+.

SEE OR SEARCH THIS CLASS, SUBCLASS:

- 18+, for electric field separation apparatus with control means responsive to sensed condition.  
109+, for solid sorbent apparatus with control means responsive to sensed condition.  
156+, for degasifying means for liquid with control means responsive to sensed condition.  
244+, for gas separation apparatus with gas and liquid contact means having control means responsive to sensed condition.

SEE OR SEARCH CLASS:

- 55, Gas Separation, subclass 283 for automatically controlled filter or separator wall cleaning means or subclass 352 for automatically controlled means causing movement of a continuous or indefinite length separating media into or out of the gas stream.  
95, Gas Separation: Processes, subclasses 1+ for processes of gas separation with control responsive to sensed condition.



- 398 Ejection of residue container or separating unit (e.g., filter or bag, etc.):**  
This subclass is indented under subclass 397. Apparatus including means to move the separated constituent (residue) collecting means or the media which effects separation wholly or partially from its normal operating position in the apparatus and to a position apart and operatively disconnected from other media or collecting means remaining, if any, to thereby permit disposal thereof without direct effect upon the other media or collecting means.
- SEE OR SEARCH CLASS:  
55, Gas Separation, subclasses 351+ for means to remove a portion of a continuous separating media from its normal use position or subclass 362 for nonautomatic ejecting means for flexible or collapsible separator bags.
- 399 Gas cutoff or diversion:**  
This subclass is indented under subclass 397. Apparatus having means in which the gaseous fluid mixture is prevented from passing through the apparatus by diverting its flow, blocking it by some stop means, or by causing cessation of a flow effecting means.
- 400 Gas pressure responsive means:**  
This subclass is indented under subclass 399. Apparatus in which the flow regulating means is actuated by a separate sensing means responsive to a pressure exerted thereon by the gaseous fluid mixture or a separated gaseous constituent.
- SEE OR SEARCH CLASS:  
55, Gas Separation, subclasses 310+ and 313 for pressure relief and separator bypass means directly responsive to a force exerted thereon by the gaseous fluid mixture.  
95, Gas Separation: Processes, subclasses 19+ for processes of gas separation with control responsive to pressure.
- 401 And temperature responsive means:**  
This subclass is indented under subclass 400. Apparatus which is provided with means to detect temperature or a change therein and to control operation of the apparatus based upon the detected temperature or change therein.
- 402 Plural gas pressure responsive means:**  
This subclass is indented under subclass 400. Apparatus which has more than one gas pressure responsive means.
- 403 For vacuum producing means (e.g., vacuum cleaner, etc.):**  
This subclass is indented under subclass 400. Apparatus in which there is a means to produce a reduced pressure (e.g., vacuum cleaner, etc.).
- 404 Collecting bag presence responsive means:**  
This subclass is indented under subclass 399. Apparatus in which the sensing means detects presence of a collecting bag for the separated constituent in order to actuate the flow regulating means for the gaseous fluid mixture.
- 405 By response to accumulated separated liquids or solids:**  
This subclass is indented under subclass 399. Apparatus in which the flow regulating means is actuated by amount of liquids or solids separated and retained by the apparatus.
- 406 By float:**  
This subclass is indented under subclass 405. Apparatus in which a buoyant body supported on accumulated liquid actuates the flow regulating means.
- 407 Temperature or humidity responsive:**  
This subclass is indented under subclass 399. Apparatus in which the flow regulating means is actuated in response to a temperature or humidity variance sensing means.
- SEE OR SEARCH THIS CLASS, SUBCLASS:  
111, for solid sorbent apparatus with control means responsive to concentration and subclass 112 for solid sorbent apparatus with control means responsive to temperature.
- SEE OR SEARCH CLASS:  
95, Gas Separation: Processes, subclass 10 for processes of gas separation with control responsive to humidity and subclasses 14+ for processes of



gas separation with control responsive to temperature.

**408 Regulation of separated constituent discharge:**

This subclass is indented under subclass 397. Apparatus wherein removal from the apparatus of a constituent which has been separated from the gaseous fluid mixture and accumulated is automatically controlled in response to a sensed condition.

**SEE OR SEARCH CLASS:**

236, Automatic Temperature and Humidity Regulation, subclasses 53 through 60 for thermostatically controlled steam condensate traps.

**409 By liquid accumulation responsive float:**

This subclass is indented under subclass 408. Apparatus in which the sensing means comprises a buoyant body supported on accumulated liquid which has been separated from the gaseous fluid mixture and retained by the apparatus, the buoyant body actuating the liquid removal regulating means in response to the amount of liquid accumulation.

**SEE OR SEARCH THIS CLASS, SUBCLASS:**

157+, for degasifying means for liquid with liquid level sensing means.

**410 Side discharge from reservoir:**

This subclass is indented under subclass 409. Apparatus wherein the removal from the apparatus of the accumulated liquid is through a surface joining the top and bottom of a container or receptacle holding the liquid.

**411 Control valve in line external to reservoir:**

This subclass is indented under subclass 410. Apparatus in which the liquid flow regulating means is a control valve located in a pipe outside of the reservoir.

**412 Control valve in external bottom discharge line from reservoir:**

This subclass is indented under subclass 409. Apparatus in which the liquid flow regulating means is a control valve located in a pipe exiting the underside of a container or receptacle holding the liquid.

**413 WITH SAMPLING MEANS:**

This subclass is indented under the class definition. Apparatus having means to remove a portion of a gaseous fluid mixture or a constituent thereof from the gas separation apparatus for purposes of analysis.

**SEE OR SEARCH CLASS:**

73, Measuring and Testing, subclasses 863+ for samplers. See particularly subclasses 863.21+ for samplers with constituent separation. See section III of class 96 for the line between these two classes.

**414 WITH INSPECTION MEANS:**

This subclass is indented under the class definition. Apparatus having means to permit viewing or examination of the condition of the apparatus or of gaseous fluid mixture or a constituent thereof inside the apparatus.

**415 Translucent:**

This subclass is indented under subclass 414. Apparatus in which the means is a material that transmits and diffuses light so that objects behind the material are not clearly perceived.

**416 Transparent:**

This subclass is indented under subclass 414. Apparatus in which the means is a material that transmits light so that objects behind the material are clearly perceived.

**417 WITH SIGNALS, INDICATORS, MEASURING, OR TESTING MEANS:**

This subclass is indented under the class definition. Apparatus having information giving means of an audible or visual nature (other than fixed exhibitors, such as signs, etc.) that give information about an apparatus or process characteristic or change therein or having means to detect an apparatus or process characteristic or change therein.

**SEE OR SEARCH CLASS:**

116, Signals and Indicators, particularly subclasses 67+ for alarms and 200+ for indicators.  
340, Communications: Electrical, subclasses 500+ for electrical automatic condition responsive indicating systems.



- 418 Light signal:**  
This subclass is indented under subclass 417. Apparatus in which the information giving means is a device that generates electromagnetic radiation that may be perceived by the unaided human eye.
- 419 Sound signal:**  
This subclass is indented under subclass 417. Apparatus in which the information giving means is a device that generates a vibratory disturbance in the pressure and density of a fluid that may be perceived by the unaided human ear.
- 420 Temperature measuring means:**  
This subclass is indented under subclass 417. Apparatus having means in which temperature or a change therein is detected.
- 421 Pressure measuring means:**  
This subclass is indented under subclass 417. Apparatus having means in which pressure or a change therein is detected.
- 422 Gas flow rate measuring means:**  
This subclass is indented under subclass 417. Apparatus having means in which gas flow rate or a change therein is detected.
- 423 Position measuring means:**  
This subclass is indented under subclass 417. Apparatus having means in which the location of an apparatus part or a change in the location of an apparatus part is detected.
- 424 WITH TIMING OR CHANGEABLE PROGRAMMING MEANS:**  
This subclass is indented under the class definition. Apparatus which is provided with control means for storing coded instructions or other data necessary to regulate operation of the separation apparatus or causing various operations to occur according to preset timing sequences or to last for predetermined durations (e.g., timer switches, etc.).
- (1) Note. The control means is not directly responsive to a sensed condition.
- 425 Of cleaning mechanism for separating media:**  
This subclass is indented under subclass 424. Apparatus in which the timing or changeable programming means is for the control of a mechanism that removes separated constituents or residue from a separating media.
- 426 Sequential cleaning of plural separating media:**  
This subclass is indented under subclass 425. Apparatus having two or more separating media from which residue or separated constituents are removed one after another.
- 427 Multiple bag-type filters in chamber:**  
This subclass is indented under subclass 426. Apparatus having a plurality of separating media comprised of nonrigid cohesive material of essentially globular, tubular, or cylindrical container configuration which encloses a space and has at least one opening for passing gas into or out of the separating media, the separating media comprised in part or entirely of gas permeable filter material.
- 428 For control of pneumatic reverse flushing:**  
This subclass is indented under subclass 425. Apparatus in which the control is of the means providing a cleaning gas into contact with the separating media in a direction opposite that of the gaseous fluid mixture during its separation.
- 429 For advancing filter media:**  
This subclass is indented under subclass 424. Apparatus in which the timing or changeable programming means is for the control of movement of a foraminous or porous mass, which separates solid or liquid particles from the gaseous fluid mixture by entrapment and retention while permitting gaseous or vaporous constituents to pass through, through the apparatus.

#### FOREIGN ART COLLECTIONS

The definitions for FOR 100-FOR 176 below correspond to the definitions of the abolished subclasses under Class 55 from which these collections were formed. See the Foreign Art Collection schedule for specific correspondences. [**Note:** The titles and definitions for *indented* art collections include all the details of the one(s) that are hierarchically superior.]



**FOR 101**

Foreign art collection including apparatus comprising means to sense a condition which may or may not occur, or a change in such condition or a lack of such a condition or the result of such a condition, the sensing means causing or permitting operation of a separate means for controlling, without the intervention of a human attendant, means to (1) regulate (e.g., divert, halt or commence) the flow of system fluid through the apparatus or part thereof or (2) regulate the movement from the apparatus of accumulated separated constituent exclusive of that which may be retained in or on the separating media itself.

**FOR 102**

Foreign art collection including apparatus having means to move the separated material (residue) collecting means or the media which effects separation wholly or partially from its normal operating position in the apparatus and to a position apart and operatively disconnected from other media or collecting means remaining, if any, to thereby permit disposal thereof without direct effect upon the said others.

**FOR 103**

Foreign art collection including apparatus in which the system fluid is prevented from passing through the apparatus by diverting its flow, blocking it by some stop means, or by causing cessation of the flow effecting means.

**FOR 104**

Foreign art collection including apparatus in which the flow control means is actuated by a separate sensing means responsive to a pressure exerted thereon by the system fluid.

**FOR 105**

Foreign art collection including apparatus in which the sensing means senses the presence of a container for separated material to cause or permit actuation of a control means for system fluid.

**FOR 106**

Foreign art collection including apparatus in which the flow control function is initiated

by the amount of constituent material separated and retained by the apparatus.

**FOR 107**

Foreign art collection including apparatus in which a buoyant body supported on accumulated liquid initiates the flow control function.

**FOR 108**

Foreign art collection including apparatus in which the means for controlling the system fluid flow is actuated in response to a temperature or humidity variance sensing means.

**FOR 109**

Foreign art collection including apparatus wherein the discharge from the apparatus of a constituent which has been separated from the system fluid and accumulated is automatically controlled in response to a sensed condition.

**FOR 110**

Foreign art collection including apparatus in which the sensing means comprises a buoyant body supported on accumulated liquid which has been separated from the system fluid and retained by the apparatus, the buoyant body initiating the control function in response to the amount of liquid accumulation.

**FOR 111**

Foreign art collection including apparatus having (A) means to bring the system fluid into (1) intimate confluent, counter current or generally mingling relationship with a liquid furnished from a separate supply for such liquid or (2) contact with the surface of a reservoir or supply tank of liquid or (B) liquid distributing means for an apparatus part for cleaning thereof or the like.

**FOR 112**

Foreign art collection including apparatus provided with a conduit or flow conductor for passing a nonsystem fluid relative to but not in direct contact with at least a portion of a bounded system fluid stream to effect heat exchange therebetween, said nonsystem fluid being separate and distinct from the system fluid.



**FOR 113**

Foreign art collection including apparatus having two or more unlike means which effect liquid contact with the system fluid or liquid distribution to an apparatus part.

**FOR 114**

Foreign art collection including apparatus having means for dividing system fluid into two or more flowing streams so that less than all of said divided streams are brought into direct contact with a liquid (e.g. bath, sheet or spray) in at least one phase of the separating operation.

**FOR 115**

Foreign art collection including apparatus in which means responsive to or actuated by velocity or pressure of the flowing system fluid affects movement of treating liquid to, from, or within the apparatus.

**FOR 116**

Foreign art collection including apparatus having direct responsive or other nonautomatic control means for the system fluid to alter or determine the amount of liquid carried or retained by the said controlled fluid.

**FOR 117**

Foreign art collection including apparatus having means (1) to control the inflow of treating liquid to the apparatus by means responsive to a condition of the said liquid, the system fluid or the apparatus, or (2) to prevent more than a desired quantity of liquid to be retained by the apparatus in accordance with some predetermined liquid level requirement.

**FOR 118**

Foreign art collection including apparatus having means to (1) remove contaminants or foreign matter from the liquid (2) add agents (e.g. anti-foamers or wetting agent) to said liquid, (3) strip sorbents or remove a diluting fluid from the liquid and make the liquid sufficiently strong to further treat the system fluid (i.e. reconcentrate) or (4) change the temperature or other physical characteristics (e.g. density, viscosity) of the liquid.

**FOR 119**

Foreign art collection including apparatus having (1) manual or power operated means (e.g. pump) located at some point in a liquid recirculation system for recirculating at least a portion of the liquid back to the point of initial use, or (2) means to drain, control the flow of, or return a treating liquid to a liquid bath or reservoir spaced apart from the contact zone.

**FOR 120**

Foreign art collection including apparatus having a continuously or intermittently moving liquid discharging or applying means to effect contact of the said liquid with the system fluid or with an apparatus part.

**FOR 121**

Foreign art collection including apparatus in which the liquid discharging or applying means (e.g. sorbent filter pad) is directly contacted by the gaseous system fluid to effect gas-liquid contact.

**FOR 122**

Foreign art collection including apparatus in which there are means for moving the liquid discharging or applying means or some part thereof between a submerged position in a liquid bath and a position for contact by the system fluid.

**FOR 123**

Foreign art collection including apparatus having means to apply liquid to a member comprised of (1) a plurality of discrete solids or (2) wick-like or fibrous massed material, said member providing interstices and thereby surface extending paths for liquid contact of the system fluid passing there-through.

**FOR 124**

Foreign art collection including apparatus in which the member has one of its extremities submerged in a liquid supply tank or reservoir.

**FOR 125**

Foreign art collection including apparatus comprising a chamber or static flow guide means designed to cause the system fluid to spin about an axis.



**FOR 126**

Foreign art collection including apparatus having means defining system fluid flow paths arranged so that one path flows about or surrounds a center or inner axial path and having means to distribute liquid in the centermost of the paths.

**FOR 127**

Foreign art collection including apparatus under subclass 235 having liquid distributing means arranged coincident with or upstream of the whirler or rotator means.

**FOR 128**

Foreign art collection including apparatus comprising means projecting, sprinkling or distributing the liquid in drop, mist or sheet form.

**FOR 129**

Foreign art collection including apparatus having a bath of treating liquid and system fluid flow conducting means arranged to direct the system fluid to the region of the bath to make contact therewith, to thereby generally reverse the direction of system fluid flow.

**FOR 130**

Foreign art collection including apparatus in which the system fluid is impinged against or passed through a moving liquid mass or cascade as distinguished from spray drops or mist, said mass being extremely thin in relation to its length and breadth, said mass being caused to flow by means other than system fluid contact or disturbance of a liquid supply bath or reservoir.

**FOR 131**

Foreign art collection including apparatus in which the system fluid is impinged against a liquid as the liquid is flowing across and in contact with an impermeable surface.

**FOR 132**

Foreign art collection including apparatus under subclass 220 comprising means to apply a cleaning liquid to the separating media as by sprinkling, projecting, washing down or submerging in a bath.

**FOR 133**

Foreign art collection including apparatus wherein the means for cleaning an apparatus part comprises a means for dipping or submerging such part in a bath.

**FOR 134**

Foreign art collection including apparatus having a reservoir of treating liquid and a system fluid flow conducting means whereby the system fluid is brought into contact with said liquid.

**FOR 135**

Foreign art collection including apparatus having (1) a gas escape means so arranged as to prevent system fluid blow back in the direction of the reservoir or (2) a supplemental liquid chamber or a liquid directing or retaining means to accept or channel liquid displaced from the reservoir by blow back.

**FOR 136**

Foreign art collection including apparatus having means for maintaining the liquid at or near the surface of the bath in a relatively quiescent state or having means which prevents the liquid of the bath from escaping during other than normal attitudes of the apparatus.

**FOR 137**

Foreign art collection including apparatus having means retained or mounted for movement in the reservoir, the movement of which increases the contact relationship of the system with the liquid in said reservoir.

**FOR 138**

Foreign art collection including apparatus having a gas separating media of non-liquid form arranged vertically above the reservoir in the normal use attitude.

**FOR 139**

Foreign art collection including apparatus having system fluid conducting means arranged to cause distortion of the surface of the bath into a jet-like spray or a lifting up of the surface of the bath.

**FOR 140**



Foreign art collection including apparatus wherein the separating media is of the filter type (i.e. solids or vapor removal is effected by blockage or coalescence by fine openings or interstices).

**FOR 141**

Foreign art collection including apparatus having a system fluid flow directing or blocking means adjacent the upstream face of the media to thereby restrict or limit the area of said media face exposed to the system fluid flow.

**FOR 142**

Foreign art collection including apparatus in which the media is of annular configuration and is coaxial with a gas passage at its center.

**FOR 143**

Foreign art collection including apparatus comprising a removable liquid retaining receptacle situated for gravity flow of the liquid from the filter medium to the said receptacle.

**FOR 144**

Foreign art collection including apparatus having means to prevent or discourage the egress of liquid from the media by gas flow action or capillarity, usually at the downstream boundary of said media.

**FOR 145**

Foreign art collection including apparatus having an inlet conductor for the system fluid which extends below the surface of the liquid to effect subsurface contact of the system fluid and liquid.

**FOR 146**

Foreign art collection including apparatus having an inlet conductor for the system fluid which extends below the surface of the liquid to effect subsurface contact of the system fluid and liquid.

**FOR 147 Gas separating means downstream of contacting means:**

Foreign art collection including apparatus having nonliquid means to separate constituents from the system fluid located beyond

the liquid contacting means in the direction of flow.

**FOR 148 Parallel vanes:**

Foreign art collection including apparatus in which the nonliquid means comprises at least two plates between which the gas flows in a tortuous or sinuous path, said plates being bent, deformed or provided with projections, and arranged relatively one to the other so that a bend, deformation or projection of one plate is spaced from the corresponding bend, etc. of the other, so as to provide substantially constant area for the gas flow.

**FOR 149 Overlapping vanes:**

Foreign art collection including apparatus in which the nonliquid means comprises a plurality of surface means which effects an abrupt change in direction of the system fluid gas flow or guides said gas flow to cause the heavier constituents thereof to dropout and remain behind, while the lighter constituents (e.g., clean gas) flow on, at least a portion of each surface means being superposed with respect to the next adjacent in the direction of gas flow.

**FOR 150 Centrifugal:**

Foreign art collection including apparatus in which the nonliquid means comprises a non-static member designed to cause the system fluid to rotate or spin around an axis.

**FOR 151 Impact plate:**

Foreign art collection including apparatus in which the nonliquid means comprises a surface the flow path of the system fluid to be impinged upon by the fluid for redirecting or altering the flow path for separation of non-gaseous constituents therefrom.

**FOR 152 Perforated plate:**

Foreign art collection including apparatus in which the nonliquid means comprises a plate having at least one opening and being positioned transverse to the flow path of the system fluid.

**FOR 153 Heat exchange:**

Foreign art collection including apparatus in which the nonliquid means comprises a



means for cooling the temperature of the system fluid to condense and separate.

**FOR 154**

Foreign art collection including apparatus having a nonliquid separating means arranged upstream of the liquid contacting means.

**FOR 155**

Foreign art collection including apparatus in which the nonliquid means for separating the system fluid is of the filter type (i.e., foraminated plates or closely or intimately arranged elements or members which collectively act as a barrier to physically hold back or retain at least one constituent of a mixture while permitting passage of the remainder).

**FOR 156**

Foreign art collection including apparatus having system fluid separating means arranged upstream of the liquid contact means, said separating means comprising a surface means which effects an abrupt change in direction of the system fluid gas flow, or guides said gas flow, to cause the heavier constituents thereof to drop out while the lighter constituent (e.g., clean gas) flows on.

**FOR 157**

Foreign art collection including apparatus providing in-flow means for a nonliquid material other than the system fluid, said material commingling with and effecting a change of said system fluid, but not including inflow of ambient air for purposes of pressure relief or addition of air for mere flow induction of system fluid.

**FOR 158**

Foreign art collection including apparatus in which a solid, or a gas derived from a normally solid source, is the material introduced into the system fluid.

**FOR 159**

Foreign art collection including apparatus comprising steam as the material.

**FOR 160**

Foreign art collection including apparatus provided with a discharge port for liquids or solids formed by temperature reduction resulting from the mixing of the system fluid and the material.

**FOR 161**

Foreign art collection including apparatus in which the in-flow means is positioned to add the material to the system fluid after the system fluid has been separated at least in one stage.

**FOR 162**

Foreign art collection including apparatus in which the material is a gas and may enter through the inflow for the system fluid or through a distinct inflow path, and in which (1) there is a single flow controller located in the common inflow line to regulate the proportion or mixture of the diverse gases or (2) controllers individual to each inflow path are provided for the regulation.

**FOR 163**

Foreign art collection including apparatus provided with means for affecting the temperature of the system fluid, or to prevent heat exchange between the system fluid and the surrounding atmosphere.

**FOR 164**

Foreign art collection including apparatus provided with a conduit or flow conductor for passing a nonsystem fluid relative to but not in direct contact with at least a portion of a bounded system fluid stream to effect heat exchange therebetween, said nonsystem fluid being separate and distinct from the system fluid.

**FOR 165**

Foreign art collection including apparatus in which the nonsystem fluid conduit or conductor is structurally associated with the confined system fluid stream at or proximate the locus of separation so that the temperature of the system fluid is affected at the separator.

**FOR 166**

Foreign art collection including apparatus having (1) means to indicate or predetermine the rate or amount of system fluid flow



passing through the apparatus, (2) means to remove a portion of constituent material from the system fluid for purposes of analysis, or (3) means to determine some physical characteristic (e.g. weight, temperature) of the system fluid.

**FOR 167**

Foreign art collection including apparatus having horological means or selectively changeable cyclical control means for (1) limiting the duration of operation or (2) determining the interval or period between operations of the apparatus or some part thereof.

**FOR 168**

Foreign art collection including apparatus in which the period or cycle is for the control of or is related to the mechanism which removes constituent material or residue from the separating media.

**FOR 169**

Foreign art collection including apparatus having two or more separating members or elements from which residue or separated constituents is removed one after another.

**FOR 170**

Foreign art collection including apparatus having information giving means of an audible or visual nature (other than fixed exhibitors e.g., signs) which give information about or permit viewing of a condition of the apparatus or extent of motion or movement of some apparatus part.

**FOR 171**

Foreign art collection including apparatus in which the information is caused to be given by a chemical or electrical change depending on the presence or absence of water or water vapor.

**FOR 172**

Foreign art collection including apparatus having means other than mere flow channels or conducting means for the system fluid for silencing the flow of said fluid through the apparatus as by sound traps or barriers, or as by fabricating surfaces of the separator from material having sound absorbing properties.

**FOR 173**

Foreign art collection including apparatus having means for producing compressional vibratory wave energy in a fluid medium to effect or enhance separation, said waves being below, within, or beyond the audible spectrum.

**FOR 174**

Foreign art collection including apparatus having (1) material separating flow passages resulting from closely spaced parallel or concentrically arranged members along the faces of which system fluid is constrained to pass without reliance upon change of direction for separation but which provide either (a) a screen or grid-like pattern at the inflow end of the arrangement or (b) surfaces on which constituent material may settle or drop; or (2) surface member(s) with somewhat exaggerated nap-like or pile-like covering along which the system fluid moves such that in effect the constituent material is swept out of the fluid stream.

**FOR 175**

Foreign art collection including apparatus having means acting to render the apparatus parts or constituent materials passing through or being delivered from the apparatus in a sterile condition.

**FOR 176**

Foreign art collection including apparatus having means to catch or otherwise dispose of material, exclusive of concentrate or residue, per se, separated from the system fluid, said material dripping, leaking, or otherwise being lost through other than the discharge outlets especially provided for the constituents of the system fluid.

END